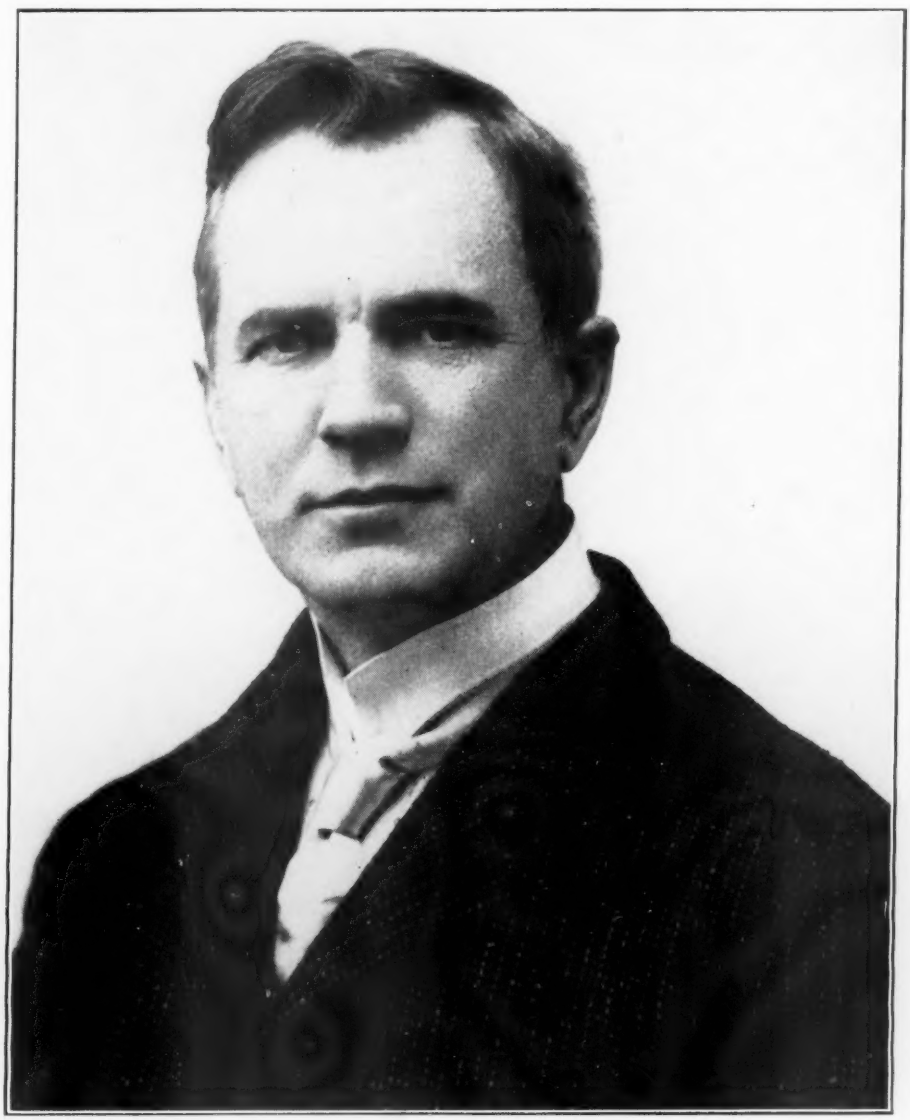
THE BULLETIN

OF THE

AMERICAN CERAMIC SOCIETY

Volume 17 JULY, 1938 Number 7



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For story, see page 292

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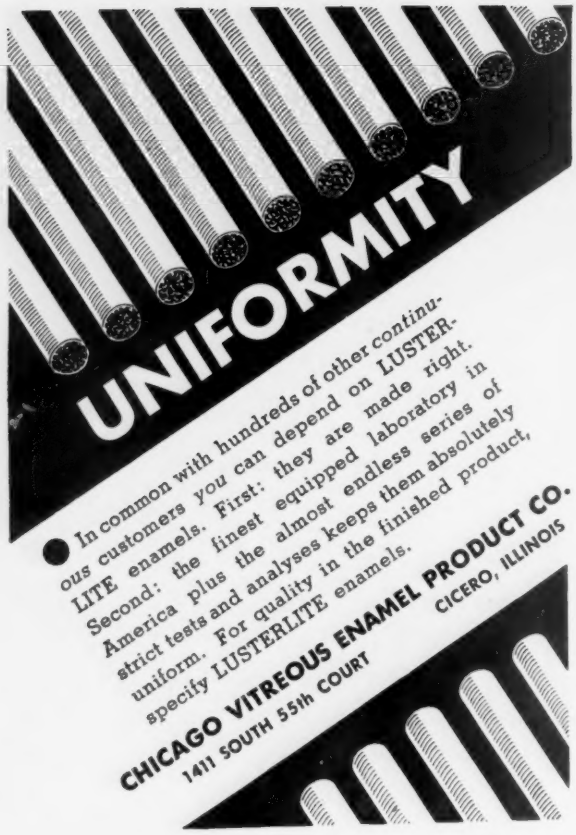
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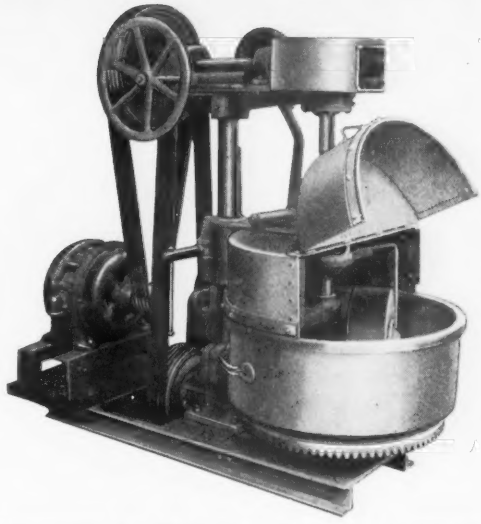

Illustrating the SKG unit, which will develop batches up to 125 lbs., depending on physical characteristics. The mixing tools can be lifted and the pan removed to the work bench, and other pans used. A wide selection of size and type mixers available.

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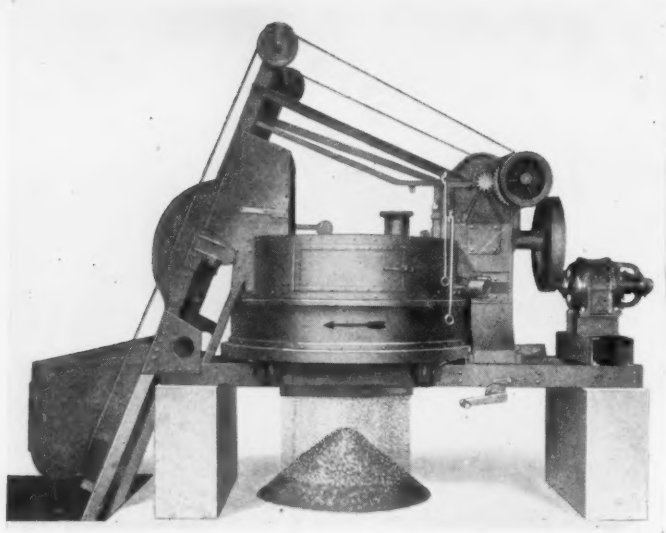

The No. 4 Lancaster Mixer in operation.

Note the elevator hopper for accumulating the batch and delivering it into the pan without loss of dust.

Note the clever central discharge through bottom of pan.

Note the self-contained construction, with one motor operating the mixer and the elevator hopper.

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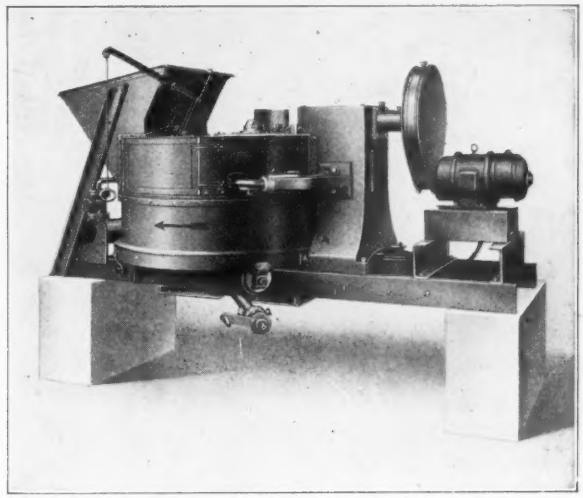

The No. 3 Lancaster Mixer with Full Batch Stationary Hopper.

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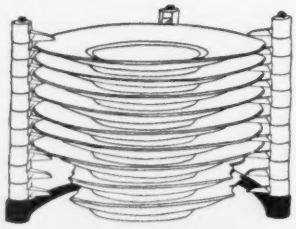

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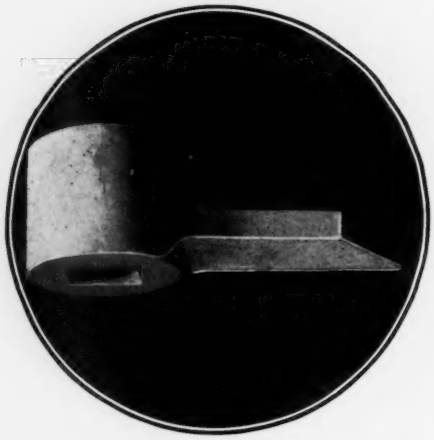

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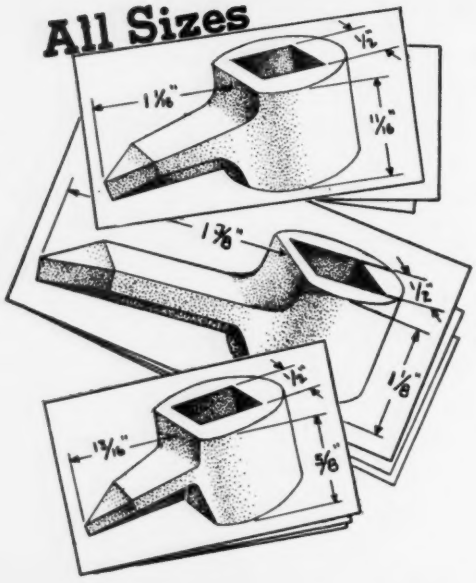

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Paper Makers Importing Co.
The Porcelain Enamel & Mfg. Co.
Spinks, H. C., Clay Co.
Titanium Alloy Mfg. Co.
The Vitro Mfg. Co.
United Clay Mines Corp.

Clay (Fire)
Denver Fire Clay Co.
Edgar Brothers Co.

Edgar Plastic Kaolin Co.
Paper Makers Importing Co.
Potters Supply Co.

Clay (German Vallendar)
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Kentucky Clay Mining Co.
The Porcelain Enamel & Mfg. Co.
The Vitro Mfg. Co.
United Clay Mines Corp.

Clay Miners
Edgar Brothers Co.
Edgar Plastic Kaolin Co.
Paper Makers Importing Co.
Spinks, H. C., Clay Co.
United Clay Mines Corp.

Clay (Potters)
Denver Fire Clay Co.
Edgar Brothers Co.
Edgar Plastic Kaolin Co.
Hammill & Gillespie, Inc.
The Hommel Co., O., Inc.
Kentucky Clay Mining Co.
Paper Makers Importing Co.
Spinks, H. C., Clay Co.
United Clay Mines Corp.

Clay (Process Equipment)
Hardinge Company, Inc.
Lancaster Iron Works, Inc.

Clay (Sagger)
Edgar Brothers Co.
Edgar Plastic Kaolin Co.
The Hommel Co., O., Inc.
Kentucky Clay Mining Co.
Paper Makers Importing Co.
Potters Supply Co.
Spinks, H. C., Clay Co.
United Clay Mines Corp.

Clay (Wad)
Kentucky Clay Mining Co.
Potters Supply Co.
Spinks, H. C., Clay Co.
United Clay Mines Corp.

Clay (Wall Tile)
Edgar Brothers Co.
Edgar Plastic Kaolin Co.
Hammill & Gillespie, Inc.
Kentucky Clay Mining Co.
Paper Makers Importing Co.
Spinks H. C., Clay Co.
United Clay Mines Corp.

Cleaners
Pennsylvania Salt Mfg. Co.
The Porcelain Enamel and Mfg. Co.

Cleaners, Chemical
Harshaw Chemical Co.
Pennsylvania Salt Mfg. Co.

Clocks (Gauge Board)
Chicago Vitreous Enamel Product Co.
The Hommel Co., O., Inc.

Cobalt Oxide
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.,
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
The Porcelain Enamel and Mfg. Co.
The Vitro Mfg. Co.

Cobalt Sulphate
Harshaw Chemical Co.
The Hommel Co., O., Inc.

Colors
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
The Porcelain Enamel and Mfg. Co.
The Vitro Mfg. Co.

Concrete (Chutes, Grouters)
Ransome Concrete Machinery Co.

Cones
The Edward Orton, Jr., Ceramic Foundation

Conveying Equipment
Frazier-Simplex, Inc.
Lancaster Iron Works, Inc.

Copper Oxide
Harshaw Chemical Co.
The Hommel Co., O., Inc.

Corhart
Corhart Refractories Co.

Cornwall Stone (Imported)
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Paper Makers Importing Co.

Crucibles (Filter, Melting, Ignition)
Carborundum Co.
Denver Fire Clay Co.
Norton Co.
Potters Supply Co.

Crushers (Clay)
Lancaster Iron Works, Inc.

Cryolite (see Kryolith)
Ceramic Color & Chemical Mfg. Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Pennsylvania Salt Mfg. Co.
The Vitro Mfg. Co.

Crystolon (Refractory Products)
Norton Co.

Cullet, Washing Plants, Incinerators, Crushers
Frazier-Simplex, Inc.

Cutters (Bar)
Ransome Concrete Machinery Co.

Decorating Supplies
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
The Vitro Mfg. Co.

Disintegrators
Hardinge Company, Inc.
Lancaster Iron Works, Inc.

Dryer (Pipe Rack)
Lancaster Iron Works, Inc.

Drying Machinery
Frazier-Simplex, Inc.
Hardinge Company, Inc.
Lancaster Iron Works, Inc.
Proctor & Schwartz, Inc.

Electrocast Refractories
Corhart Refractories Co.

Enameling Equipment (Complete)
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
Frazier-Simplex, Inc.
The Hommel Co., O., Inc.
The Vitro Mfg. Co.

Enameling Furnaces
Carborundum Co.
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
Electro Refractories & Alloys Corp.
The Hommel Co., O., Inc.
Lancaster Iron Works, Inc.
Norton Co.

Enameling Iron (Sheet)
American Rolling Mill Co.
Bethlehem Steel Co.

Enameling Muffles
Bethlehem Steel Co.
Carborundum Co. (*Carbofrax*)
Chicago Vitreous Enamel Product Co.
Electro Refractories & Alloys Corp.
Frazier-Simplex, Inc.
Norton Co. (*Alundum*)

Enameling (Practical Service)
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
The Hommel Co., O., Inc.
Metal & Thermit Corp.
The Porcelain Enamel & Mfg. Co.
Titanium Alloy Mfg. Co.
The Vitro Mfg. Co.

Enamels
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
The Porcelain Enamel and Mfg. Co.
The Vitro Mfg. Co.

Enamel Oxide
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.

Enamels (Porcelain)
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
The Hommel Co., O., Inc.
The Porcelain Enamel & Mfg. Co.
Titanium Alloy Mfg. Co.
The Vitro Mfg. Co.

Equipment (Porcelain Enameling)
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
The DeVilbiss Co.
Hardinge Company, Inc.
The Hommel Co., O., Inc.

Exhaust Systems
The DeVilbiss Co.

Feldspar
Ceramic Color & Chemical Mfg. Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Paper Makers Importing Co.
The Porcelain Enamel and Mfg. Co.
The Vitro Mfg. Co.

Fire Brick
Carborundum Co.
Corhart Refractories Co.
Denver Fire Clay Co.
Electro Refractories & Alloys Corp.
Norton Co.

Fire Brick—Process Equipment
Lancaster Iron Works, Inc.

Fire Clay
Denver Fire Clay Co.
Spinks, H. C., Clay Co.

Flint
Ceramic Color & Chemical Mfg. Co.
Du Pont de Nemours, E. I., & Co., Inc. R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Paper Makers Importing Co.
The Porcelain Enamel and Mfg. Co.

Flint Pebbles
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
The Hommel Co., O., Inc.
The Vitro Mfg. Co.

Floors (Non-Slip)
Norton Co.

Fluorspar
Harshaw Chemical Co.
The Hommel Co., O., Inc.

French Flint
Paper Makers Importing Co.

Frit
Allied Engineering Co.
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Porcelain Enamel & Mfg. Co.
Titanium Alloy Mfg. Co.
The Vitro Mfg. Co.

Frosting Mixtures
Harshaw Chemical Co.
The Hommel Co., O., Inc.

Fuel Oil Systems and Control, Stokers
Bethlehem Steel Co.
Frazier-Simplex, Inc.

Furnaces
Allied Engineering Co.
Carborundum Co. (*Carboradiant*)
Chicago Vitreous Enamel Product Co.
Denver Fire Clay Co.
Frazier-Simplex, Inc.
The Hommel Co., O., Inc.
Swindell-Dressler Corp.

Furnaces-Enameling
Swindell-Dressler Corp.

Glass Bending Ovens, Glass Decorating Machines
Frazier-Simplex, Inc.

Glass Equipment
Hartford-Empire Co.
Lancaster Iron Works, Inc.

Glass Melting Tanks and Furnaces
Frazier-Simplex, Inc.

Glass Thickness Gauge
Bausch & Lomb Optical Co.

Glaze and Body Spar
Ceramic Color & Chemical Mfg. Co.
Du Pont de Nemours, E. I., & Co., Inc. R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Paper Makers Importing Co.
The Porcelain Enamel and Mfg. Co.
The Vitro Mfg. Co.

Glazes and Enamels
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
The Porcelain Enamel & Mfg. Co.
Titanium Alloy Mfg. Co.
The Vitro Mfg. Co.

Glaze Spar
Ceramic Color & Chemical Mfg. Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Paper Makers Importing Co.

Goggles
Cover H. S
The Hommel Co., O., Inc.
Willson Products, Inc.

Gold
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. H. & Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
The Vitro Mfg. Co.

Gold Decorations
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
The Hommel Co., O., Inc.

Granulators
Hardinge Company, Inc.
Lancaster Iron Works, Inc.

Grinding Wheels
Carborundum Co. (*Carborundum and Aloxite*)
Chicago Vitreous Enamel Product Co.
Norton Co. (*Alundum-Crystolon*)

Hearths
Carborundum Co. (*Carbofrax* heat treating)
Corhart Refractories Co.
Electro Refractories & Alloys Corp.
Norton Co. (*Crystolon*)

Hearths (Fused Al_2O_3, SiC)
Electro Refractories & Alloys Corp.

Hearths (High Aluminous Clay, Electrically Sintered Aluminum Oxide, Silicon Carbide)
Carborundum Co.
Norton Co.

Hoppers (Floor, Tower)
Ransome Concrete Machinery Co.

Hose (Air and Fluid)
The DeVilbiss Co.

Hydrofluoric Acid
Harshaw Chemical Co.
The Hommel Co., O., Inc.

Iron Chromite
Harshaw Chemical Co.

Iron (Enameling)
American Rolling Mill Co.
Bethlehem Steel Co.

Iron Oxide
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
The Porcelain Enamel and Mfg. Co.
The Vitro Mfg. Co.

Kaolin
Ceramic Color & Chemical Mfg. Co.
Edgar Brothers Co.
Edgar Plastic Kaolin Co.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Paper Makers Importing Co.
United Clay Mines Corp.
The Vitro Mfg. Co.

Kellog AA Refractories
Electro Refractories & Alloys Corp.

Kilns, China (Decorating)
Allied Engineering Co.
Denver Fire Clay Co.
Drakenfeld, B. F., & Co.
Frazier-Simplex, Inc.
The Hommel Co., O., Inc.
Swindell-Dressler Corp.

Kilns-(Electric, Circular, Tunnel)
Allied Engineering Co.
Swindell-Dressler Corp.

Kiln Furniture (Silicon Carbide, Semi-Silicon Carbide) (Refractory)
Electro Refractories & Alloys Corp.
Louthan Mfg. Co.

Kyanite
Celo Mines, Inc.

Kryolith (See Cryolite)
Pennsylvania Salt Mfg. Co.

Laboratory Ware
Norton Co.

Lehr Tile (High Aluminous Clay, Electrically Sintered Aluminum Oxide, Silicon Carbide)
Carborundum Co.
Electro Refractories & Alloys Corp.

Lehrs
Frazier-Simplex, Inc.
Swindell-Dressler Corp.

Lehrs (Electric or Fuel Heated)
Frazier-Simplex, Inc.
Swindell-Dressler Corp.

Lehr Loaders
Frazier-Simplex, Inc.

Linings (Furnace Refractory, Block Refractory Plate, Brick and Tile)
Carborundum Co.
Chicago Vitreous Enamel Product Co.
Corhart Refractories Co.
Denver Fire Clay Co.
Electro Refractories & Alloys Corp.
Norton Co.
The Vitro Mfg. Co.

Lithium Carbonate
Foote Mineral Co.

Lithium Minerals
Foote Mineral Co.

Magnesia (Fused)
Electro Refractories & Alloys Corp.
Norton Co.

Magnesia (Sintered, Calcined)
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
The Porcelain Enamel and Mfg. Co.

Magnesite
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
The Vitro Mfg. Co.

Magnesite Calcined
Foote-Mineral Co.
The Hommel Co., O., Inc.

Magnesium Carbonate
Harshaw Chemical Co.
The Hommel Co., O., Inc.

Manganese
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
The Vitro Mfg. Co.

Manganese Dioxide
Foote Mineral Co.

Manganese (Oxide)
Ceramic Color & Chemical Mfg. Co.
Corhart Refractories Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.

Masks (Breathing)
The DeVilbiss Co.
Willson Products, Inc.

Metals (Porcelain Enameling)
American Rolling Mill Co.
Bethlehem Steel Co.

Microscopes (Polarizing)
Bausch & Lomb Optical Co.

Minerals
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
The Vitro Mfg. Co.

Mixers
Ransome Concrete Machinery Co.

Mixers (Batch)
Lancaster Iron Works, Inc

Mixers (Concrete, Paving, Road Paving, Plaster, Asphalt, Truck, Mortar, Bituminous)
Ransome Concrete Machinery Co.

Mold Sanders
Lancaster Iron Works, Inc.

Muffles (Furnace)
Allied Engineering Co.
Carborundum Co. (*Carbofrax*)
Chicago Vitreous Enamel Product Co.
Denver Fire Clay Co.
Electro Refractories & Alloys Corp.
Frazier-Simplex, Inc.
Norton Co.

Muffles (Laboratory)
Electro Refractories & Alloys Corp.

Mullite (Refractories)
Electro Refractories & Alloys Corp.

Muriatic Acid
Denver Fire Clay Co.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Pennsylvania Salt Mfg. Co.

Needle Antimony
Harshaw Chemical Co.
The Hommel Co., O., Inc.

Nickel Salts
Harshaw Chemical Co.
The Hommel Co., O., Inc.

Nitrates (Cobalt, Sodium)
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
The Vitro Mfg. Co.

Nitre
Harshaw Chemical Co.
The Hommel Co., O., Inc.

Non-Gro Refractories
Electro Refractories & Alloys Corp.

Norbide (Norton Boron Carbide)
Norton Co.

Olivine
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.

Opacifiers
Ceramic Color & Chemical Mfg. Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Metal & Thermit Corp.
The Porcelain Enamel & Mfg. Co.
Titanium Alloy Mfg. Co.
The Vitro Mfg. Co.

Overglaze Colors
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.

Oxides
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Metal & Thermit Corp.
Porcelain Enamel & Mfg. Co.
Titanium Alloy Mfg. Co.
The Vitro Mfg. Co.

Palladium Decorations
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
The Hommel Co., O., Inc.

Pins
Chicago Vitreous Enamel Product Co.
The Hommel Co., O., Inc.
Louthan Mfg. Co.
Potters Supply Co.

Pins (Tile Setter)
Louthan Mfg Co.

Placers (Concrete Pneumatic)
Ransome Concrete Machinery Co.

Platinum Decorations
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
The Hommel Co., O., Inc.

Polariscopes
Bausch & Lomb Optical Co.
Frazier-Simplex, Inc.

Porcelain Enameling Service (Practical)
American Rolling Mill Co.
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
Hardinge Company, Inc.
The Hommel Co., O., Inc.
The Porcelain Enamel & Mfg. Co.
Titanium Alloy Mfg. Co.
The Vitro Mfg. Co.

Porcelain Enamels
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
The Hommel Co., O., Inc.
The Porcelain Enamel & Mfg. Co.
Titanium Alloy Mfg. Co.
The Vitro Mfg. Co.

Potters Wheels
Denver Fire Clay Co.

Potash (Carbonate)
Ceramic Color & Chemical Mfg. Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.

The Hommel Co., O., Inc.
Solvay Sales Corp.
The Vitro Mfg. Co.

Producer Glass Plants
Frazier-Simplex, Inc.

Pug Mills
Lancaster Iron Works, Inc.

Pyrites (Natural Iron Sulphide)
Foote Mineral Co.
The Hommel Co., O., Inc.

Pyrometer Tubes
Carborundum Co.
Electro Refractories & Alloys Corp.
Montgomery Porcelain Products Co.

Pyrometer Tubes (Refractory and Hard Porcelain)
Denver Fire Clay Co.
McDanel Refractory Porcelain Co.
Norton Co.

Pyrometers (Optical, Radiation, Surface, Immersion, Needle)
Pyrometer Instrument Co.

Pyrometric Cones
The Edward Orton, Jr., Ceramic Foundation

Racks, Firing (Refractory)
Louthan Mfg. Co.

Raw Material Handling Equipment
Frazier-Simplex, Inc.
Lancaster Iron Works, Inc.

Refractometers
Bausch & Lomb Optical Co.

Refractories
Carborundum Co.
Corhart Refractories Co.
Denver Fire Clay Co.
Electro Refractories & Alloys Corp.
Louthan Mfg. Co.
Norton Co.

Refractory Materials
Carborundum Co.
Chicago Vitreous Enamel Product Co.
Corhart Refractories Co.
Denver Fire Clay Co.
Electro Refractories & Alloys Corp.
Louthan Mfg. Co.
Norton Co.
Titanium Alloy Mfg. Co.

Represses (Automatic)
Lancaster Iron Works, Inc.

Respirators
Chicago Vitreous Enamel Product Co.
Cover, H. S.
The DeVilbiss Co.
The Hommel Co., O., Inc.
Willson Products, Inc.

Rutile
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I. & Co., Inc., R. & H. Chemicals Dept.
Foote Mineral Co.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Metal & Thermit Corp.
Titanium Alloy Mfg. Co.
The Vitro Mfg. Co.

Saggers
Carborundum Co.
Electro Refractories & Alloys Corp.
Norton Co.
Potters Supply Co.

Salt Cake
American Potash & Chemical Co.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Pennsylvania Salt Mfg. Co.

Sandblast Helmets
Willson Products, Inc.

Sand Grinder and Sifters
Lancaster Iron Works, Inc.

Saponin
The Hommel Co., O., Inc.

Selenite of Sodium
Drakenfeld, B. F., & Co.
The Hommel Co., O., Inc.
The Vitro Mfg. Co.

Selenium
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
The Vitro Mfg. Co.

Setters (Tableware)
Louthan Mfg. Co.

Sheaves (Tower)
Ransome Concrete Machinery Co.

Sheets (Enameling Iron)
American Rolling Mill Co.
Bethlehem Steel Co.

Silica (Fused)
Electro Refractories & Alloys Corp.
The Hommel Co., O., Inc.

Silicate of Soda
Ceramic Color & Chemical Mfg. Co.
Denver Fire Clay Co.
The Hommel Co., O., Inc.
Harshaw Chemical Co.

Silicon Carbide
Carborundum Co.
Electro Refractories & Alloys Corp.
Norton Co.

Silicon Carbide Firesand
Carborundum Co.

Sillimanite Refractories
Denver Fire Clay Co.
Electro Refractories & Alloys Corp.

Slabs (Furnace)
Carborundum Co.
Electro Refractories & Alloys Corp.
Norton Co.

Soda Ash
American Potash and Chemical Corp.
Ceramic Color & Chemical Mfg. Co.
Denver Fire Clay Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Pennsylvania Salt Mfg. Co.
Solvay Sales Corp.
The Vitro Mfg. Co.

Sodium Antimonate
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Metal & Thermit Corp.
The Vitro Mfg. Co.

Sodium Fluoride
Ceramic Color & Chemical Mfg. Co.
Denver Fire Clay Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
The Vitro Mfg. Co.

Sodium Metasilicate
Harshaw Chemical Co.

Sodium Nitrite
Harshaw Chemical Co.
The Hommel Co., O., Inc.

Sodium Silica Fluoride
Ceramic Color & Chemical Mfg. Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.

Sodium Uranate
Harshaw Chemical Co.
The Hommel Co., O., Inc.

Soot Blowers
Frazier-Simplex, Inc.

Special Machines
Frazier-Simplex, Inc.

Spar
Ceramic Color & Chemical Mfg. Co.
Du Pont de Nemours, E. I., & Co., Inc. R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Paper Makers Importing Co.
The Vitro Mfg. Co.

Spray Booths
The DeVilbiss Co.
The Hommel Co., O., Inc.

Spraying Equipment
The DeVilbiss Co.
The Hommel Co., O., Inc.

Spurs
Louthan Mfg. Co.
Potters Supply Co.

Stacks
Lancaster Iron Works, Inc.

Steel Plate Construction
Bethlehem Steel Co.
Lancaster Iron Works, Inc.

Stilts
The Hommel Co., O., Inc.
Louthan Mfg. Co.
Potters Supply Co.

Sulfuric Acid
Denver Fire Clay Co.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Pennsylvania Salt Mfg. Co.

Talc
Ceramic Color & Chemical Mfg. Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Paper Makers Importing Co.

Tanks
Frazier-Simplex, Inc.

Tank Blocks
Corhart Refractories Co.

Tanks (Pickle)
Chicago Vitreous Enamel Product Co.
The Hommel Co., O., Inc.

Tanks for Raw Material Steel or Concrete
Bethlehem Steel Co.
Lancaster Iron Works, Inc.

Tile (Floor)
Norton Co.

Tile (Muffle)
Carborundum Co.
Electro Refractories & Alloys Corp.
Norton Co.

Tile Setter Pins
Louthan Mfg. Co.

Tile (Refractory)
Carborundum Co. (*Carbofrax*)
Chicago Vitreous Enamel Product Co.
Denver Fire Clay Co.
Electro Refractories & Alloys Corp.
Norton Co.

Tile (Wall)
Denver Fire Clay Co.

Tin Oxide
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
The Hommel Co., O., Inc.
Metal & Thermit Corp.
The Vitro Mfg. Co.

Titanium
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Titanium Alloy Mfg. Co.
The Vitro Mfg. Co.

Titanium Oxide
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Metal & Thermit Corp.
Titanium Alloy Mfg. Co.
The Vitro Mfg. Co.

Towers (Concrete, Concrete Elevating, Steel Elevating)
Ransome Concrete Machinery Co.

Tri Sodium Phosphate
Harshaw Chemical Co.

Trucks
Lancaster Iron Works, Inc.

Tubes (Insulating)
Carborundum Co.
Louthan Mfg. Co.
McDanel Refractory Porcelain Co.
Norton Co.

Tubes (Pyrometer)
Carborundum Co.
Denver Fire Clay Co.
Electro Refractories & Alloys Corp.
McDanel Refractory Porcelain Co.
Norton Co.

Uranium Oxide
Harshaw Chemical Co.
The Hommel Co., O., Inc.

Uranium Oxide (Yellow-Orange-Black)
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
The Hommel Co., O., Inc.
The Vitro Mfg. Co.

Water Softening Plants
Frazier-Simplex, Inc.

Wet Enamel
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
The Hommel Co., O., Inc.
The Porcelain Enamel & Mfg. Co.
Titanium Alloy Mfg. Co.
The Vitro Mfg. Co.

Whiting
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc. R. & H. Chemicals Dept.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Paper Makers Importing Co.
The Vitro Mfg. Co.

Winding Drums
Lancaster Iron Works, Inc.

Zinc Oxide
Ceramic Color & Chemical Mfg. Co.
Du Pont de Nemours, E. I., & Co., Inc. R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
The Vitro Mfg. Co.

Zircon
Foote Mineral Co.
The Hommel Co., O., Inc.

Zirconia
Ceramic Color & Chemical Mfg. Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Metal & Thermit Corp.
Titanium Alloy Mfg. Co.
The Vitro Mfg. Co.

Zirconium Oxide
Foote Mineral Co.
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Zirkite (Natural ZrO_2)
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NEWS

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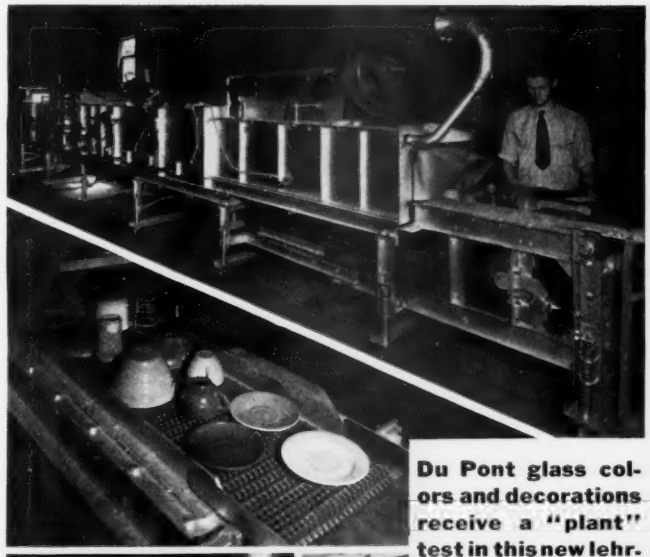
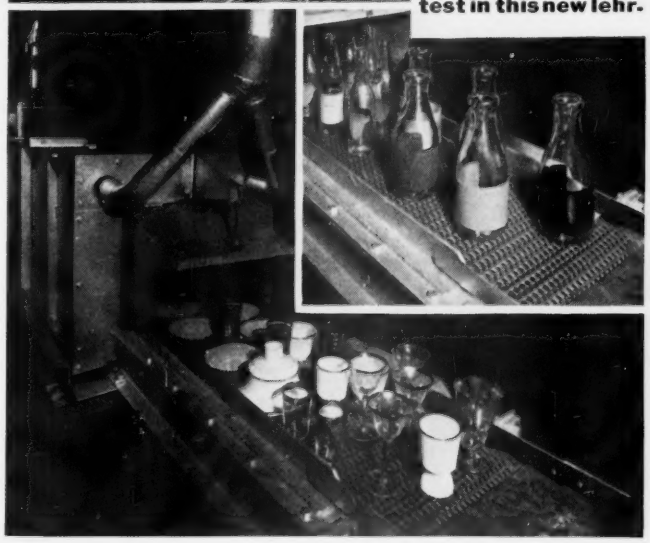


Du Pont glass colors and decorations receive a "plant" test in this new lehr.



The shade and finish of colors and decorations fired in this lehr duplicate the results obtained in actual plant production. This du Pont Pre-Testing insures exact color match and suitability of the decoration for your particular ware.

DU PONT

The R. & H. Chemicals Department
E. I. DU PONT DE NEMOURS & CO., INC.
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THE BULLETIN
OF THE AMERICAN CERAMIC SOCIETY

A Monthly Publication Devoted to Proceedings of the Society and Promotion of Coöperative Research of Technical, Scientific, and Art Questions

VOLUME 17 July, 1938 **NUMBER 7**

PAPERS

THE CLAYS OF ALABAMA*

By T. N. McVay

Abstract

The important clays of the State are the kaolins, the stoneware, and the bauxitic clays of the Coastal Plain, the fire clays and shales of the Coal Measures, and the residual kaolins of the Crystallines.

I. Introduction

The state of Alabama may be divided into three geologic regions, *viz.*, the Coastal Plains, the Paleozoics, and the Crystallines. These divisions are shown on the map (Fig. 1).

II. Coastal Plains

The formations of the Coastal Plains are of Quaternary, Tertiary, and Upper Cretaceous ages. The youngest formations, the Quaternary, are nearest the coast and are succeeded to the north by the Tertiary. The Cretaceous again stretches as a wide belt across the State to the north of the Tertiary and lies uncomformably on the Paleozoics and the Crystallines. These formations are a continuation of those found in Georgia, but unlike the Georgia formations they do not contain any large deposits of sedimentary kaolins. There are a few strata of white clays near the coast, but they are intermingled with red clays and sand and are of no economic importance. The only clays of value found thus far in marketable quantities in this region are the kaolins and stoneware clays of the Tuscaloosa formation which is in the lower part of the Upper Cretaceous.

These sedimentary kaolins occur in the northwestern part of the State, principally in Marion and Lamar counties. The clay lies at the base of the Tuscaloosa formation and rests on the coal measures of Pennsylvanian age. The deposit located at Chalk Bluff in Marion County is best known, and it will probably be developed on a commercial basis. These kaolins are of high quality, but for the most part have a heavy overburden of gravel with a thickness in many places of more than one hundred feet. Because they have been indurated to some extent, most of them will not slake even in hot water and must be ground to develop plasticity. When ground to pass 200-mesh, they become very plastic and have a bonding strength only slightly lower than that of Florida kaolin. It has been found recently that the white clay from Chalk Bluff is suitable for a paper filler. The extent of the deposits is unknown because the depth of cover makes exploration costly. Some outcrops have a thickness of from eight to ten feet.

The other important clays found in the Coastal Plains are the stoneware or plastic fire clays. They usually occur as lens deposits in the Tuscaloosa formation and are characterized by their gray color. They are usually mottled, however, with red and brown iron compounds and are not of uniform quality. Carefully hand-picked sam-

* Presented at the Fortieth Annual Meeting, American Ceramic Society, New Orleans, La., March 28, 1938 (General Session on Ceramic Resources of the Southern States). Received May 11, 1938.

ples have shown a P.C.E. as high as cone 34, but there is no known tonnage available, even of moderate grade. There is, however, a sufficient amount of clay in widely scattered localities to serve as a raw material for several small potteries.

In the Tertiary deposits of the Coastal Plains, there are small deposits of bauxitic clays associated with bauxite as well as vast amounts of flood plain clays. The latter are suitable for the manufacture of common brick.

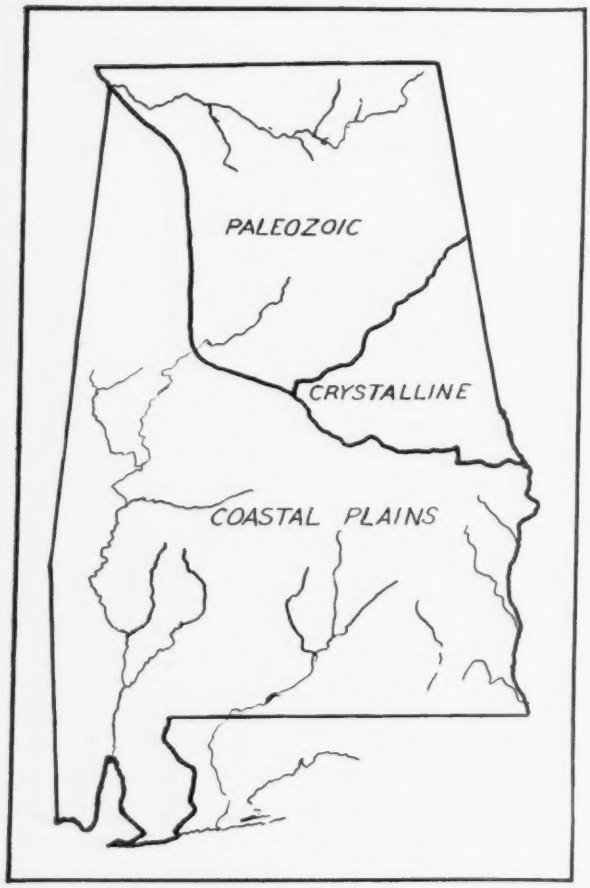

FIG. 1.

III. Paleozoics

These contain the shales and fire clays of the Coal Measures as well as numerous small deposits of other clays which have resulted from the decomposition of older rocks. The shales are the most important commercial clays of the State and are used for the manufacture of building block, paving, face, and common brick, sewer pipe, and roofing tile. All of these plants, except one near Gadsden, are located in the Birmingham district on account of the market, shipping facilities, and the availability of coal and natural gas. The principal harmful impurities are concretions, calcareous and sandy in nature. The writer has seen some near Tuscaloosa six feet in diameter.

The fire clays in this area, which underlie the Black Creek and Mary Lee coal seams, are of some economic importance. Fire clays are mined at Warrior, eighteen miles north of Birmingham, and at Cordova, which is about thirty miles northwest. The clays have a P.C.E. of approximately cone 28 and are not high-grade clays. They are suitable for the manufacture of ladle brick, and small amounts are added to some of the higher grade refractories. The Stephenson Brick Company operates a plant at Cordova and is using this material for the manufacture of glazed brick and tile as well as for buff and gray face brick. In addition to the clays mentioned, there are numerous deposits that have resulted from the weathering of some of the older Paleozoic rocks A small tonnage of high-grade clay with a P.C.E. of cone 32 is available at Green Pond, south of Birmingham, but the material lacks bonding strength. At the present time, experiments are being conducted on the beneficiation of a white sand which contains a white clay. The clay, which is available from washing, has a P.C.E. of cone 32; it is very white but lacks dry strength. The deposit is located about 20 miles southwest of Birmingham, and the clay may prove to be of value as an addition to refractory cements, of which a large tonnage is used in the metallurgical industries of the Birmingham district.

Near Fort Payne in De Kalb County, there are some deposits of siliceous clays with a P.C.E. of cone 30, which have resulted from the weathering of the Fort Payne chert. One of these was found to be a good fullers' earth. In the same vicinity, there are small deposits of bauxitic clays.

A clay, with a silica content of 85%, is found near Eastaboga in Calhoun County, and this is utilized by some of the foundries of the district as well as for an ingredient of silica cement. The P.C.E. is low and this limits its possible use. In this same vicinity, there is also a unique sink-hole deposit, which has been worked intermittently for more than twenty years. The deposit consists of horses of pink, white, and black lignitic clays in contact with each other. These have been processed and have been found to be ex-

cellent bond clays with a high P.C.E. value. The deposit is local and evidently extends over only a small area.

Because the State lacks any considerable amount of high-grade refractory clays, it is necessary to import these from other states, chiefly the soft and hard kaolins of Georgia. Grog is supplied from used refractories, and numerous old blast furnaces when dismantled have furnished brick to the local brick manufacturers. A small amount of flint fire clay is also shipped in, inasmuch as such clays are not found in this region.

IV. Crystallines

These igneous and metamorphic rocks cover a large area in the eastern part of the State. Primary kaolins are present with mica in many deposits in Clay, Coosa, and Tallapoosa counties, but no large amount of high-grade clays has been found. The development of these deposits is hampered by transportation difficulties because the deposits are a considerable distance from a railroad.

A plant manufacturing face and common brick has been operated for a number of years at Sylacauga, using weathered phyllite schist as a raw material.

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THE CERAMIC RESOURCES OF TENNESSEE *

By George I. Whitlatch

I. Introduction

Tennessee has become one of the leading industrial states of the South, mainly because of its central location and its great wealth of natural resources. Not the least of these resources are its ceramic materials. The high-grade raw clays mined in West Tennessee are normally valued at more than $600,000, while, widely distributed, abundant deposits of lesser grades of clay, as shales and underclays, are the basis of an extensive clay products industry (composed of more than forty plants) that annually produces between $2^1/_2$ and 3 million dollars worth of finished ware. The varieties of ware made from native materials is exceeded by few, if any, other Southern states.

Cheap coal from the Cumberland Plateau fields has been a vital factor in the development of this clay products industry and may fairly be listed as a ceramic resource.

Feldspar and quartz, mined in the famous Spruce Pine district of North Carolina, are ground at Erwin, Tennessee, and these materials have contributed much to the success of electrical porcelain and semiporcelain dinnerware plants at Knoxville and Erwin; the production annually amounts to about $1,000,000 worth of finished ware.

In addition to its clays and other commercially used ceramic materials, Tennessee has a number of other minerals that are more or less adaptable to ceramic uses.

II. East Tennessee

East Tennessee, which includes the Great Smoky Mountains, Great Valley, and Cumberland Plateau areas, is the dominant ceramic region of the State, both as to variety of resources and as to extent of industrial development.

(1) Shales and Clays

Twenty-three heavy ware plants and two large potteries are in operation. The greater part of this industry uses native shales, chiefly from the Pennington formation of Mississippian age that crops out along the basal slopes of Cumberland Plateau. Contributing materially to the industry, however, are Cambrian, Ordovician, and Silurian shales of the Valley area; Pennsylvanian underclays and shales from the coal-bearing Cumberland Plateau; alluvial clays of the Tennessee and Holston rivers; and residual clays derived from the limestone and shale formations of the Valley area.

Only two heavy ware plants are currently operating in Cumberland Plateau, but the quality and quantity of shales and underclays in that area, in conjunction with the cheaply available coal, justify additional ceramic development.

* Presented at the Fortieth Annual Meeting, American Ceramic Society, New Orleans, La., March 28, 1938 (General Session on Ceramic Resources of Southern States). Received May 2, 1938.

(2) Limestone and Marble

East Tennessee is also well supplied with a wide variety of other minerals adaptable to ceramic processes. High-calcium limestones of Mississippian age, suitable for milling into ceramic whiting, occur in Cumberland Plateau, and in the marble-producing area of Knoxville are some marbles that might be similarly milled. Throughout the Valley of East Tennessee are great thicknesses of dolomite and dolomitic limestones of Cambro-Ordovician and Cambrian ages that could, with the nearby sources of cheap coal and power, support a chemical industry for the recovery of magnesia suitable for refractory uses.

(3) Pure Silica

Sands of more than 99 per cent pure silica can be obtained in Cumberland Plateau from certain Pennsylvanian formations, notably the Sewanee Conglomerate; these sands, pure enough for glass manufacture or for milling into potter's flint, will be produced from an operation starting in the Chattanooga region early in the summer of 1938.

(4) Barite and Bauxite

Barite, which finds its way into enamels, glazes, and other ceramic processes, is mined in the Sweetwater district between Chattanooga and Knoxville. This area is largely responsible for Tennessee's position as fourth leading barite-mining state of the country.

Bauxite, suitable for making abrasives and refractories, has been mined to the extent of 350,000 to 400,000 tons in the Chattanooga area, and lesser mining has also been done in Carter County near Elizabethton in the extreme northeastern part of the State. Geologic investigations indicate possible undiscovered deposits of these ores.

(5) Manganese

Manganese, which finds varied and extensive usage in glass, pottery, tile, and other ceramic products, occurs in East Tennessee in about seventeen counties, but the principal area of mining is along the western front of Smoky Mountains.

Other ceramic resources of this area, but of lesser importance because of their limited occurrence, are kaolin, tripoli, bentonite, and flint clay.

III. Middle Tennessee

Middle Tennessee, which includes the Central Basin and surrounding Highland Rim, is dominantly a limestone area, with ceramic resources limited largely to residual and alluvial clays. Brick is the dominant product of the clayworking industry that centers at Nashville. Here three heavy ware plants and a florist ware pottery use the alluvial clays of Cumberland River. Three other brick plants within this area use residual clays. In Putnam County are three small family-operated potteries making domestic stoneware from local residual clays, and at Cookeville in this same County a small artware pottery uses local underclays and some plastic clay imported from West Tennessee.

(1) Tripoli

One of the chief allied ceramic resources of the Middle Tennessee area is tripoli, or "soft silica," that occurs in extensive deposits along the western Valley of Tennessee River. This tripoli, now being milled at Collinwood in Wayne County, analyzes more than 99% silica and, locally, shows less than 0.02% iron oxide; the high degree of purity and natural pulverulent character of this tripoli should make it an attractive substitute for potter's flint in certain ceramic processes.

(2) Whiting

Whiting, milled from high-calcium limestones of Mississippian age, is currently produced at Sparta in White County in the eastern Highland Rim area. This product is now shipped to the linoleum and rubber trades but is probably suitable for many kinds of ceramic ware.

(3) Barite and Bentonite

Barite of exceptionally high purity is mined in Fentress County, the northeastern Highland Rim area, and numerous other barite deposits of lesser importance are known elsewhere in Middle Tennessee.

Bentonite and manganese deposits of doubtful commercial value are also known in Middle Tennessee.

IV. West Tennessee

(1) Ball Clay

The area lying between Tennessee and Mississippi rivers is best known for its production of high-grade ball, wad, sagger, and other plastic clays, which are annually shipped to all of the principal pottery centers of the United States.

These clays, sedimentary in origin, occur as lenticular lenses in sands of Cretaceous and Tertiary ages. Three major operators and about a dozen smaller companies and individuals work a total of some 20 pits, in normal times, producing more than $600,000 worth of raw clays. In 1936, these West Tennessee mines alone produced 27% of the national output of ball clays,[1] and in times past as much as 40% of the U. S. total has been mined here.

Despite its production of raw clays, West Tennessee has not developed an extensive clay products industry. A domestic stoneware pottery at Paris and three brick plants of this area use the local plastic sedimentary clays. The loess deposit which mantles the westernmost third of this area is used for brickmaking at three Memphis plants.

(2) Molding Sand

Molding sand, mined from the Ripley (Cretaceous) formation in the Benton-Carroll counties area of West Tennessee is an allied ceramic resource of major economic importance. The annual production, currently estimated at about 30,000 tons, is one of the greatest in the South.

[1] U. S. Bureau of Mines, Minerals Yearbook, 1937, p. 1259.

(3) Bleaching Earths

Since the early months of 1937, West Tennessee has been producing bleaching earths for the petroleum industries. These earths are milled from clays of the Porters Creek (Tertiary) formation, the oil-bleaching activity of which was proved by the writer in 1935.[2] These same clays, furthermore, fire naturally to densities of 20 to 25 per cent less weight than ordinary clays, and laboratory tests indicate possible adaptation of the clays to lightweight building units.[3]

(4) Tripoli

Tripoli is milled in Perry County, and numerous other localities have similar deposits of good grade material, all of which have possibilities as a substitute for potter's flint.

(5) Kaolin

Sedimentary kaolin of possible commercial extent occurs in the Ripley formation of Carroll County; recent chemical analyses of this kaolin are almost identical with those of certain North Carolina and Georgia kaolins.

Division of Geology
Nashville, Tennessee

[2] G. I. Whitlatch, "Porters Creek Clay of West Tennessee as a Bleaching Agent for Oils," *Oil and Soap*, **13**, 38–44 (1936).

[3] G. I. Whitlatch, "Light-Weight Product Possibilities of the Porters Creek Clay of West Tennessee," Tenn. Div. of Geology, *Resources of Tenn. (2d Series), 1937*, No. 1 (1937).

CONE DEFORMATION STUDY OF THE BARIUM OXIDE–CLAY–SILICA SYSTEM*

By Warren A. Zimmer and Arthur S. Watts

The use of BaO as a flux was, until recently, limited to glasses and to the glazes in which it is substituted for PbO. It is now also being used in super-refractories. A deformation study of the $BaO–Al_2O_3–SiO_2$ system was reported by Watts,[1] but this study was very general and the intervals were so great as to have limited industrial value. The present investigation was undertaken to provide information on that portion of the $BaO–Al_2O_3–SiO_2$ system which represents the maximum fluxing behavior of BaO when introduced into clay-silica mixtures.

The materials used were as follows:

BaO from C.P. $BaCO_3$
Al_2O_3 from Florida kaolin with the following analysis: ignition loss 14.95%, SiO_2 46.95%, Al_2O_3 36.75%, Fe_2O_3 0.80%, CaO 0.15%, MgO 0.20%, alkalis 0.24%, and TiO_2 0.18%
Excess SiO_2 from flint.

The various members at 5% intervals were studied both on rapid firing in a pot furnace and slow firing in a kiln, and the influence of time in the vitrifying process is thus disclosed.

The lowest melting eutectic under rapid-firing and slow-firing treatments was indicated to be about 30% BaO, 10% Al_2O_3, and 60% SiO_2, which corresponds to the formula 1.0 BaO, 0.5 Al_2O_3,

* Presented at the Thirty-Eighth Annual Meeting, American Ceramic Society, Columbus, Ohio, March 31, 1936 (White Wares Division). Received November 17, 1936.

[1] A. S. Watts, "Deformation Study of $MgO–Al_2O_3–SiO_2$ Mixtures," *Trans. Amer. Ceram. Soc.*, **19**, 453–59 (1917); p. 457.

5 SiO_2. Intervals of 2.5% were taken around this point to establish it as having the lowest deformation temperature. This composition was found to deform at Orton standard pyrometric cone 3^2 in the rapid-fire treatment and at cone 4^1 in the slow-fire treatment.

In the rapid-fire treatment, another area of low-temperature deformation was indicated in the area of the composition 50% BaO, 5% Al_2O_3, 45% SiO_2 (1.0% BaO, 0.15% Al_2O_3, 2.25% SiO_2) with mixtures greatly increased in refractoriness bounding it.

These two fusible areas appear to be joined by mixtures of slightly more refractory material, suggesting that a considerable range of fusible glasses in this group may be produced in compositions varying from 30 to 50% BaO, 5 to 10% Al_2O_3, and the remainder silica.

It is worthy of note that the mixtures containing 30 and 35% BaO and 10% Al_2O_3 have normal deformation rates, whereas the mixtures containing 50 and 55% BaO and 5% Al_2O_3 display abrupt deformation typical of the alkaline earths.

The activity of Al_2O_3 in amounts up to 15% is especially apparent in the lowering of the deformation temperature of the BaO–SiO_2 mixtures. The presence of 20% Al_2O_3 apparently produces mixtures of about the same refractoriness as with BaO–SiO_2 mixtures of similar ratio but with no Al_2O_3. In this study, the composition of the lowest melting BaO–SiO_2 binary eutectic was found to approximate 50% BaO and 50% SiO_2 and it deformed at cone 13^3 under the slow-fire treatment.

The following conclusions have been made in this study:

(1) A well-defined low-temperature area is clearly indicated both in rapid-firing and slow-firing treatments.

(2) Another low-temperature area was indicated only in the rapid-fire treatment.

(3) The results indicate that there is a need of careful firing control when using Al_2O_3 up to 10% with BaO and SiO_2 mixtures. With Al_2O_3 in excess of 10%, the rate of firing does not appear to be so significant.

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COMMUNICATIONS—CERAMIC HISTORY

WILLARD D. RICHARDSON

Editor's Note: Willard D. Richardson has been a practicing ceramic engineer for many years. His inventions brought many changes in design and operation of kilns, driers, and plant layout. His activities in cooperation with ceramists in this and other organizations can not be enumerated without writing the history of these organizations. Ceramists are greatly in debt to Willard D. Richardson.

Mr. Richardson was born August 28, 1857, on a farm near Georgetown, New York. He started school in a near-by country school house; 1865–1871, attended village school at West Eaton, N. Y.; eight years, 1871–1879, in school at Hamilton, N. Y., two years in Hamilton Union School; two years in Colgate Academy and four years in Madison (now Colgate) University, graduating with the class of 1879, degree of A.B.; A.M. degree, 1884.

Teaching Experience

1879–1880, Principal of High School, Chattanooga, Tenn.; 1881–1882, Columbia School of Mines, New York, N. Y.; 1882–1884, Brooklyn and Great Neck, N. Y., and working in Dr. Sloan's Chemical Laboratory, New York, N. Y.

At Sloan's laboratory he was given a clay to analyze and ascertain its commercial value; read everything in Astor (later New York) Library on clays and clay-product manufacture; made firing tests of the clay; bought the only book on brickmaking at that time, Brick and Tile Making, by Edward Dobson, London, 1882—still in his library. (A new edition of this book "largely rewritten" by A. B. Searle, 1936, *Ceram. Abs.*, **16** [8] 246 (1937).)

In 1885, Mr. Richardson left New York for Puget Sound, stopped to see two classmates in Minneapolis, and remained there five years, tutoring and preparing young men for college; established the Northwestern Preparatory School and also taught two winters in the public evening schools.

Early Contacts with Clayworking

At the reading room of the Minneapolis Builders' Exchange, he saw the *Clay-Worker*, published in Indianapolis, and the *Brick, Tile, and Pottery Gazette*, published

in Ottawa, Ill., reviving Mr. Richardson's interest in clay. He immediately subscribed for the *Clay-Worker* and read every issue thereafter; also received, through the *Clay-Worker*, *Tonindustrie-Zeitung*, and *Töpfer und Ziegler-Zeitung* (now *Ziegelwelt*), and later became a subscriber to *Tonindustrie-Zeitung*.

In Minneapolis he saw brick made for the first time and became acquainted with Mr. Boyd, who was selling the Kennedy dry press and promoting companies for the manufacture of dry-press brick and was himself president of the Anoka Press Brick Co. He was shown the drawings of the Boyd press which was then being built for the plant at Coon Creek. Boyd's promotions all ended in failure and he became so involved that he had to leave, went to Chicago, and later formed the Chisholm, Boyd & White Co. With their help, the press was greatly improved and is still a leader.

The successor to Boyd in the presidency of the Anoka Co. gave Mr. Richardson the privilege of spending the next summer vacation at the Coon Creek plant working at nearly every place on the plant; the first job was filling the mold by hand of the revolving-table Kennedy press. Nothing was said about pay, but at the end of the summer he was given one dollar a day, in addition to board at the company boarding house.

Mr. Richardson spent the two next summers in dry-press brick plants at Monticello and Rush City, Minn., then sold his school and went to St. Louis to investigate the making of dry-press brick at the plants of Anthony Ittner and the Hydraulic-Press Brick Co.

Manager of Plant Operations

From 1888 to 1893, Mr. Richardson was Superintendent of the Central Press Brick Co., of Cleveland, Ohio, building and operating their plant at North Baltimore, Ohio. From 1893 to 1896, he was General Manager of the Cleveland Vitrified Press Brick Co., Cleveland, Ohio, operating on paving blocks for the city streets. While there he organized, with Frank H. Robinson, the Ohio Ceramic Engineering Co.

From 1896 to 1901, Mr. Richardson was General Manager of the Ohio Mining & Mfg. Co., New York, completing and operating their dry-press plant at Shawnee, Ohio.

From 1901 to 1902, he was in Cleveland, Ohio, developing shale property and promoting a company for the manufacture of paving brick and face brick, making complete drawings of the new plant; also building a soft-mud brick plant for surface clay. His partner died before incorporation and the property was tied up in probate court for two years. Having obtained engineering consulting work in the clay field, he went to Columbus to consult Professor Orton about it. Orton said, "It is something that ought to be done, Richardson, and you are just the man for it. I wouldn't hesitate a minute."

Consulting Engineer

From 1902 to 1911, Mr. Richardson devoted to engineering service, five years alone and five years with Ellis Lovejoy, under the corporate name of the Richardson-Lovejoy Engineering Co. From 1911 to 1916, he was again in Shawnee, Ohio, in charge of the Ohio Mining & Mfg. Co., a stiff-mud face brick plant with a Youngren kiln that had been built two years before. This plant was sold in 1913 to the Claycraft Co., Columbus, Ohio, and was operated under Mr. Richardson's management until 1916.

From 1916 to 1918, Mr. Richardson was General Manager of the Hebron Fire & Pressed Brick Co., Hebron, N. D., making dry-press brick and hollow building tile.

In 1918, he was in war service with the Emergency Fleet Corporation, in Georgia, Alabama, Pennsylvania, and New Jersey.

From 1918 to 1921, he managed the business of the Ceramic Supply & Construction Co. and also was in consulting work for brick companies.

Mr. Richardson sold the shop and equipment of the Ceramic Supply & Construction Co. to Frank H. Robinson, Pittsburgh; since then, he has devoted his time solely to engineering service to the clay industries.

Original Developments

1888. Improvement of the Simpson press (with P. L. Simpson).

1888–1893. Superior dry-press face brick in red and brown and buff and mixtures with manganese; rock-face, beaded-enamel brick.

1893–1896. Shaking screen; automatic feeder for pug mill; repress for paving blocks; machine for automatically cutting paving brick and feeding them to repress; drawing hot air from cooling downdraft kilns and blowing it under the discharge end of a tunnel drier.

1896–1901. Exploitation of coal-formation clays at Shawnee, Ohio, discovering the Brookville clay about 75 feet below factory, shafting for and development of mining operations for brick manufacture; method of preparing clay for a superior dry-pressed brick; method of producing a bright golden-flash dry-press brick.

1902–1903. System of regeneration for round, downdraft kilns; smokeless, coking-table furnace for downdraft kilns; automatic stop and lock of transfer cars at cooling tracks of tunnel drier.

1904–1905. A semi-automatic machine for side-cutting face brick, delivering them on pallets separated and delivering the loaded pallets on a conveyer drier (with C. B. Harrop and J. G. Holl).

1905–1911. With Ceramic Supply & Construction Co.; the first piano-wire screens made in America (idea from England); the first disk feeders in America (idea from Germany).

1914–1916. Hand-stoked gas producer for kilns: producer gas-fired compartment kiln.

1917. Brick wall structure.

1918. With Emergency Fleet Corporation, lightweight aggregate for concrete ships.

1918–1921. With Ceramic Supply & Construction Co., vibrating screen; apparatus for producing textures on stiff-mud brick.

1925–1926. Building wall structure.

1926. Cross-draft tunnel kiln.

1927. Downdraft tunnel kiln.

1930–1937. Improvements in downdraft tunnel kiln.

1935–1936. Die for making many-hole brick; insulated wall structure.

1936–1937. Flat arch for tunnel kilns.

Charter Member of American Ceramic Society

Mr. Richardson is a Charter Member of the American Ceramic Society. He served as President in 1906. For several years he edited the annual *Transactions*. He also served as the representative of the Society on A.S.T.M. Committee D-14. For many years he was a member of the National Brick Makers' Association and served as president of that organization as well as a member of the Committee on Technical Investigations. He is a member of the English Ceramic Society.

Publications of W. D. Richardson

Miscellaneous

"Preparation of Clay for Dry Presses," N.B.M.A., Rept. of 2nd Convention, Oct. 20, 1887.
"Presidential Address," N.B.M.A., Rept. of 14th Convention.
"Our Industry—Its Future," N.B.M.A., Rept. of 17th Convention.
"Electricity in Manufacture of Clayware," N.B.M.A., Rept. of 28th Convention.
"Waste in Clay Industries," N.B.M.A., Rept. of 32nd Convention.
"Brickworks Engineering," announcing the first entrance of an engineer in this field, in America, as an exclusive occupation.
"Fire Brick Manufacture," serial in *Brick*, 1903.
"Controlling Clayworking Operations," twelve articles in *Brick* (1906–1907–1908).
"Lignite as a Fuel for Ceramic Kilns," *Brick Clay Rec.*, **52** [5] (1918).
"Firing Brick and Tile, Practical Ways of Reducing Cost," *Contract Rec. & Eng. Rev.*, **39,** 77 (1925).
"Building-Wall Structure," U. S. Pat. 1,597,110, Aug. 24, 1926.
"Method and Apparatus for Firing Clayware," U. S. Pat. 1,599,589, Sept. 14, 1926.
"Method and Apparatus for Firing Clayware," U. S. Pat. 1,628,273, May 10, 1927.

From the Clay-Worker

"A Brickmaker's Education," an address before the Ceramic Association of Ohio State University, XXIX (9).
"Clay Dust," serial (1902–1903–1904).
"Drying Brick," 1905.
"Burning Brick in Downdraft Kilns," 1905.
"Working Wet Lime Clays," **78,** 336–37 (1922).
"Oil Firing of Clay Products," **80,** 142–43 (1923); III–IV, **80,** 458–59, 552–53 (1923).
"Saving Fuel in Brick Manufacture," **84** [1] 26 (1925).
"Tunnel Kilns for Firing Fire Brick," **86** [4] 296–98 (1926).
"Brick Buildings at Less Cost," **88** [6] 460 (1927).
"Highly Porous Light-Weight Brick," **93** [1] 43 (1930).
"Standardizing Masonry Units and Openings," **94** [1] 37 (1930).
"Light-Weight Brick," **94** [2] 103 (1930).
"Meaning of 'Heavy' Clay Products," **93** [3] 220 (1930).
"Standardization of Brick Units," **94** [2] 107–108 (1930).
"Standardization of Masonry Units: Hollow Building Tile," **94** [3] 175 (1930).
"Color in Brick Buildings," **96** [2] 105 (1931).
"Impending Problem in Common Brick Industry," **93** [6] 160 (1931).
"What Can Be Done to Promote Larger Use of Brick?" **97** [6] 298–99 (1932).
"Drying Clay Products," **99** [6] 212–13 (1933).
"Waste-Heat Tunnel Driers," **100** [2] 56 (1933).

From the Transactions of the American Ceramic Society

"Equipment of a Modern Paving-Brick Plant," **4,** 189–99 (1902).
"Work of the Ceramic Engineer in the Brick-Making Industry," **5,** 237–41 (1903).
"Improvement in Brick Driers," **6,** 227–30 (1904).
"Presidential Address," **8,** 42–44 (1906).
"Performance of a Producer Gas-Fired Continuous Kiln," **14,** 778–91 (1912).
"Producer Gas-Fired Continuous Kiln (discussion)," **16,** 602–605 (1914).

From the Journal of the American Ceramic Society

"Adaptability of Gas-Fired Compartment Kiln for Burning of Clay Products," **5** [5] 254 (1922).
"Lamination, Discussion of Cause and Cure," **5** [6] 369 (1922).
"Producer Gas for Burning Refractories," **6** [7] 799–807 (1923).
"Brick at Less Cost," **7** [8] 614–19 (1924).
"A Modern Sewer-Pipe Plant," **9** [6] 354–61 (1926).
"Possibilities of Tunnel Kiln for Sewer Pipe," **10** [9] 693–98 (1927).
"Greater Efficiency in Tunnel Driers," **12** [12] 761–64 (1929).
"Application of Downdraft Principle to Tunnel Kilns," **14** [8] 572–77 (1931).
"Further Studies of the Tunnel Kiln," **17** [9] 279–82 (1934).

From the Bulletin of the American Ceramic Society

"Producer Gas for Burning Refractories," **2** [12] 375–76 (1923).
"Saving Fuel in Firing Common Brick," **4** [6] 254–60 (1925).
"A Prophecy That Failed," **12** [2] 48 (1933).
"Memorial to Charter Members Who Passed Away This Year," **14** [3] 125–26 (1935).
"Part of the Brick Manufacturer in the Better-Housing Program," **14** [9] 293–96 (1935); addendum, **14** [10] 336–37 (1935).
"Control of Coloration of Clayware in the Tunnel Kiln," **15** [10] 330–34 (1936).
"De-Airing in Auger Machine without Vacuum Pump," **16** [1] 14–16 (1937).
"Should the Downdraft Periodic Kiln Be Round or Rectangular?" **17** [5] 197–200 (1938).

PROPOSED MODIFICATIONS OF THE CLASSIFICATION OF CERAMIC DINNERWARE *

By Arthur S. Watts

At the Thirty-Ninth Annual Meeting of the American Ceramic Society, a classification of bodies and glazes was presented, followed with brief descriptions of varieties of dinnerware.

This material presented was considered by most of the American tableware producers, and some specific modifications were proposed. It is apparent, however, that any attempt to classify dinnerware bodies more definitely than "porous, semivitreous, and vitreous" calls for terminology not now recognized. The same is true of glazes, if the classification is to be more definite than "soft, medium hard, and hard."

After study and numerous conferences, the following classification is offered:

Basic Classification of Dinnerware Bodies

(A)	(B)	(C) Absorption (%)
(1) Soft; porous; opaque	Majolica	+15
(2) Hard; porous; opaque	Fine earthenware	10–15
(3) Semivitreous	Semivitreous china	4–10
(4) Near vitreous; slightly translucent	Heavy restaurant porcelain	0.3–4
(5) Vitreous; moderately translucent	Hotel china	Less than 0.3
(6) Vitreous; highly translucent	Household china and porcelain	Less than 0.1

Tests and Definitions

Translucency: Determined by holding the article one foot from a 25-watt electric light in a room without natural or other artificial light.

Absorption: Determined by boiling in water (10 or more fragments of ware of not more than $^1/_2$ square inch surface area each) for 2 hours and allowing to cool to room temperature without removal from the water. Wipe surfaces to remove excess water and transfer to closed weighing bottle. In calculating percentage water absorption, consider $12^1/_2\%$ of the dry weight of glazed specimens as glaze, and correct dry and wet values accordingly.

Basic Classes of Glazes

Soft	Majolica	Scratches readily with steel point
Medium soft	Fine earthenware	Scratches moderately with steel point
Medium hard	Semivitreous china	Scratches slightly with steel point
Hard	American china	Does not scratch or scratches with extreme difficulty with steel point
Extra hard	Porcelain	Can not be scratched with steel point

The scratching instrument shall be a round bar not more than $^1/_4$ by 6 inches, ground to flat ends with edges sharp and smooth. It shall be operated by moving from left to right with the hand, keeping the cutting edge parallel to direction of stroke.

Scratch hardness could be made the basis of a glaze classification, if this test could be approved as standard.

Based on tests made on commercial ware, Table I was developed at Ohio State University. On this basis, the following classification would be possible:

Width of scratch (mm. $\times 10^{-3}$) (average of 25 values)	
Soft	40 or more
Medium soft	31–40 inclusive
Medium hard	21–30 "
Hard	16–20 "
Extra hard	15 or less

Regarding varieties of dinnerware, the following types seem to meet the demand:

Semivitreous Porcelain: Same as semivitreous china body but covered with a hard glaze of the hotel-china type; applied to the unfired body and body and glaze matured together.

American China: Divided into sub-classes as follows:

(*a*) *American Household China:* Produced in thin ware similar in weight to the porcelain dinnerware of Europe and having a water absorption of less than 0.1%.

(*b*) *American Hotel China:* Produced in medium thick and rolled-edge ware for hotel, with a water absorption of less than 0.3%.

Department of Ceramic Engineering
Ohio State University
Columbus, Ohio

* Presented at the Fortieth Annual Meeting, American Ceramic Society, New Orleans, La., March, 1938 (White Wares Division). Received June 23, 1938.

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TABLE I

GLAZE HARDNESS MEASUREMENTS ON COMMERCIAL TABLEWARE*

The data in this table were developed with a loaded diamond-point technique. The point (a trihedral with face angles of 130 degrees) travels at a constant rate under a constant load of 100 grams. The rate was 3.88 inches per hour. The technique seems to provide a measure of the relative scratch hardness. The average of 25 width measurements (using a filar micrometer) is reported and also the high and low values showing the variation.

	Width of scratch (mm. × 10^{-3}) av. of 25 values (European tableware)			
Designation	Max.	Min.	Av.	Comments
Coalport English bone china	24.77	22.04	24.04	Notable tendency to splinter in parts of scratch
Allerton's old English bone china	27.75	26.16	26.94	Fairly good edges; not much splintering
Villeroy and Boch-German earthenware	30.88	26.54	28.46	Fairly good outlines, though rough in a few spots
Royal Doulton(English)	31.97	26.91	29.93	Good edges for measuring
Irish Belleek china	24.64	23.40	24.13	Good outlines
Wedgwood earthenware	25.57	20.27	22.90	No splintering; some directional changes as though due to harder spots or micro-valleys
Limoges-French porcelain	16.76	15.52	16.25	Fairly good outline
Black Knight German porcelain	15.08	8.35	9.95	Splintered in a few spots accounting for relative large variation in data
Royal Justafsberg Swedish porcelain	59.06*	18.56	44.30	*Splintered terribly; highly irregular surface
	(American tableware)			
American semivitreous china	35.94	21.66	28.00	In general quite uniform
American vitreous china	22.49	15.07	18.93	In general quite uniform
American electrical porcelain (cone 10 single fire)	15.64	13.66	14.73	

* Data on foreign ware from one specimen of each brand; data on American ware include all brands of each type of ware.

ACTIVITIES OF THE SOCIETY

R. E. BIRCH ELECTED TRUSTEE REPRESENTATIVE FROM THE INSTITUTE OF CERAMIC ENGINEERS

Raymond Embree Birch has been elected to serve as Trustee Representative to the American Ceramic Society from the Institute of Ceramic Engineers. His term extends from 1938 to 1941.

Mr. Birch was born in McConnelsville, Ohio, December 18, 1905. He attended the grade schools and high school in McConnelsville. From Ohio State University he received, in 1927, the degree of Bachelor of Ceramic Engineering, and, in 1937, the professional degree of Ceramic Engineer.

In 1927, Mr. Birch was associated with the Carlyle-Labold Co., Portsmouth, Ohio, as ceramic engineer and salesman; from 1928 to 1930, he was research engineer at the Ohio State University Engineering Experiment Station, Roseville, Ohio; from 1930 to the present time, he has been research engineer with the Harbison-Walker Refractories Co., Pittsburgh, Pa.

Mr. Birch became a member of the American Ceramic Society in 1929. He served as chairman of the Pittsburgh Section in 1935 and chairman of the Refractories Division in 1936. He is also a member of Sigma Xi, Keramos, Pi Delta Epsilon, Society of Glass Technology, American Association for the Advancement of Science, and American Society for Testing Materials, in which Society he has served as chairman of the Spalling Sub-Committee of Committee C-8 on Refractories. Mr. Birch also served on the Heat Transfer Committee, American Society of Mechanical Engineers, although not a member of that Society.

Among his professional and practical achievements, Mr. Birch has (1) accomplished successful evacuation of mold box in pressing semidry-pressed brick, demonstrating for the first time that pressure cracking of these brick was due to entrapped air (this work has led to the commercial adoption of vacuum pressing); (2) collaborated in the development of forsterite refractories which have given the mineral, olivine, its first industrial uses; and (3) had a share in the development of (*a*) a superduty fireclay brick, (*b*) a stabilized high-lime magnesite clinker, Quickset, now used in open-hearth bottoms, (*c*) chemically bonded chrome and magnesite brick, and (*d*) forsterite and magnesite bonding mortars.

Publications

"Relation of a Modulus of Grain Size to Mechanical Strength of Sagger Mixtures," *Jour. Amer. Ceram. Soc.*, **12** [7] 451–54 (1929).

"Evacuation of Air in Pressing of Dry-Press Brick Eliminates Pressure Cracks," *Brick & Clay Rec.*, **75** [7] 438–42 (1930).

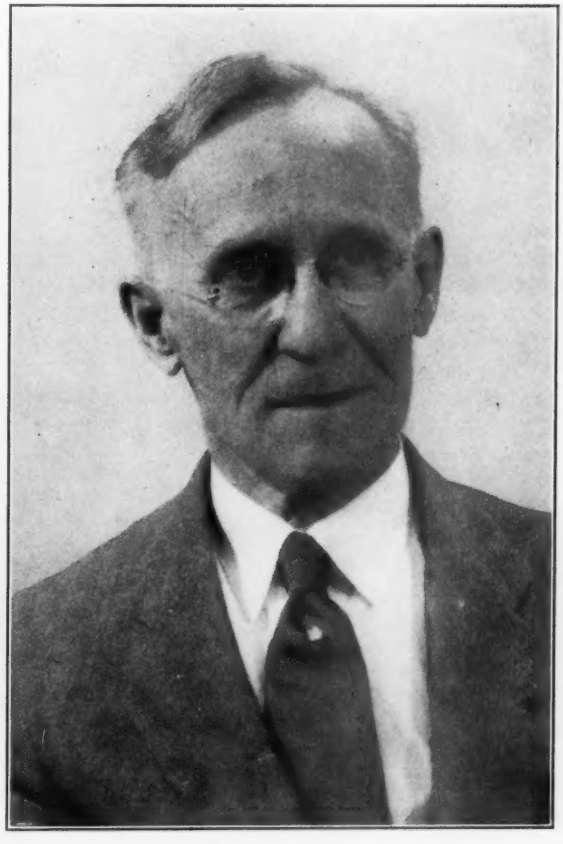
"Researches in Dry-Press Refractories: I, Relation of Forming Pressure to Physical Properties," *Ohio State Univ. Eng. Expt. Sta. Bull.*, No. 56 (1930).

"Forming Pressure of Dry-Pressed Refractories: I, Effect of Pressure Variations on Properties of Green and Dry Bodies," *Jour. Amer. Ceram. Soc.*, **13** [4] 242–55 (1930); "II, Effect of Pressure Variations on Fired Properties," *ibid.*, **13** [11] 831–44 (1930).

"Entrapped Gases as Factor in Stratification," *Amer. Jour. Sci.*, pp. 405–14 (1933).
"Control of Pressure in Toggle Brick Press," *Amer. Refrac. Inst. Tech. Bull.*, No. 38 (1933).
"Reaction Temperature between Various Types of Refractory Brick," *ibid.*, No. 52 (1934).
"Forsterite and Other Magnesium Silicates as Refractories," *Jour. Amer. Ceram. Soc.*, **18** [6] 176–92 (1935).
"Ceramic Materials at Roseville State Brick Plant," *Ohio State Univ. Eng. Expt. Sta., Special Bull. for Ohio Dept. of Welfare* (with co-author) (1929).
"Magnesite," chapter 24 of Industrial Minerals and Rocks, Amer. Inst. Mining Met. Engrs., 1937.
"Mullite Development in Superduty Fireclay Brick" (with F. A. Harvey), *Jour. Amer. Ceram. Soc.*, **19** [11] 322–27 (1936).
"Olivine and Forsterite Refractories in America" (with F. A. Harvey), *Ind. Eng. Chem.*, **30** [1] 27–32 (1938).
"Forsterite Refractories, Their Origin and Service in Industry," *Brick & Clay Rec.*, **92** [6] 38–44 (1938).

A number of patents have been issued to Mr. Birch and a co-inventor.

Ray Birch



Arthur S. Watts

ARTHUR SIMEON WATTS ELECTED TRUSTEE REPRESENTATIVE FROM THE CERAMIC EDUCATIONAL COUNCIL

Arthur S. Watts, professor and chairman of the Ceramic Engineering Department, Ohio State University, Columbus, Ohio, has been elected to serve a three-year term as Trustee Representative to the American Ceramic Society by the Ceramic Educational Council. Professor Watts' term will expire in 1941.

Professor Watts was born March 27, 1876, in Zanesville, Ohio. He received his early education in the public schools of Zanesville. From 1897 to 1901 he attended Ohio State University, and, in 1910, Charlottenburg Technische Hochschule, Berlin, Germany. In 1928, he was given the professional degree of Ceramic Engineer at Ohio State University.

Professor Watts has been associated with the following companies: F. M. Locke, Victor, N. Y., 1901; Bell Pottery Co., Findlay, Ohio, 1902–1903; and Locke Insulator Co., Victor, N. Y., 1904–1909. From 1911 to 1913, he was quarry technologist in the U. S. Bureau of Mines, and from 1914 to 1915, he was associate professor in the Ceramic Engineering Department, Ohio State University. He has held his present post, professor and chairman of the Ceramic Engineering Department, Ohio State University, since 1915.

Professor Watts became a member of the American Ceramic Society in 1902. He served as vice-president in 1909; president in 1912; associate dean of Fellows, 1935; and dean of Fellows, 1936. He is also a member of Sigma Xi, Tau Beta Pi, Keramos, The Ceramic Society (English), and S.P.E.E.

Among his professional and practical achievements, Professor Watts has developed (1) the standard high-voltage porcelain insulator bodies in use since 1902; (2) the glazes and stains for use in dental porcelain modification; and (3) the classification, terminology, and definitions for ceramic dinnerware.

Professor Watts has published sixty-two articles in the *Transactions, Journal,* and *Bulletin of the American Ceramic Society,* and in other technical Journals.

A number of patents have been issued to Professor Watts in the United States, England, France, Germany, and Canada.

BALTIMORE-WASHINGTON SECTION

The spring meeting of the Baltimore-Washington Section was held June 4, 1938, at the Longfellow Hotel, Baltimore, Md. Twenty-eight members and guests were present. Dinner was served at 6:30 P.M., and was followed by a business meeting. G. H. Spencer-Strong, *Chairman,* presided.

The following officers were elected for the year 1938–1939:

Chairman: G. R. SHELTON, National Bureau of Standards, Washington, D. C.
Vice-Chairman: J. D. TETRICK, Baltimore Enamel & Novelty Co., Baltimore, Md.
Secretary-Treasurer: DONALD HUBBARD, National Bureau of Standards, Washington, D. C.

After the business meeting, George S. Blome, Baltimore Enamel & Novelty Co., spoke on "Some Aspects of Porcelain Enamel in Architecture." He discussed the development of porcelain enamel in architecture from its earliest phases to its latest applications, and pointed out how, in several instances, it had developed along lines different than those anticipated. Lantern slides were used to illustrate Mr. Blome's talk.

—JAMES D. TETRICK, *Secretary-Treasurer*

PRESENTATION OF HONORARY MEMBERSHIP DIPLOMA TO LUCIEN DELLOYE

June 13, 1938

On Monday, May 30, at 10:30 A.M., I went to the office of Director Gentil of the Saint Gobain Glass Works in Paris where Mr. André Delloye and Dr. Bernard Long, Director of Laboratories for Saint Gobain, were also present. M. Lucien Delloye, for whom the American Ceramic Society's certificate of Honorary Membership was intended, was seriously ill with a heart attack and his physician prohibited his seeing anyone. I commented briefly about the father's accomplishments in the glass field and presented the diploma by proxy to his son André, who in turn responded, expressing his father's and his own great appreciation of the recognition which our Society had given.

After the presentation, Dr. Long showed me through the very completely equipped laboratories of Saint Gobain and then there was a luncheon at Restaurant Laurent, at which Professor José De Artigas of Madrid, who is now in Paris engaged in statistical researches, was also present.

The Saint Gobain officials were most gracious and hospitable, and I consider that I was given a real privilege when the American Ceramic Society delegated me to present the Delloye diploma.

—ALEXANDER SILVERMAN

DIVISIONS ANNOUNCE AUTUMN MEETING SCHEDULES

Division	Place	Date
White Wares and Materials and Equipment	Bedford Springs Hotel, Bedford, Pa.	September 15–17
Glass	Chamberlin Hotel, Old Point Comfort, Va.	September 9–12
Refractories	Bedford Springs Hotel, Bedford, Pa.	September 2–3

CERAMIC SCHOOL NOTES

ADDITIONAL HONORARY ADVANCED DEGREES, 1938*

NEW YORK STATE COLLEGE OF CERAMICS

Honorary Degree of Doctor of Science

A. F. GREAVES-WALKER, University of North Carolina, Raleigh, N. C.

Professional Degree of Ceramic Engineer

GEORGE A. CRAWFORD, Kittanning, Pa.
H. B. DUBOIS, Trenton, N. J.

Charles Fergus Binns Medal

CHARLES MABRY HARDER, Alfred, N. Y.

Ceramic Association of New York Prize Thesis

RODNEY ANDREW JONES. *Thesis:* "A Study of Some of the Effects of Thermit Reactions in Ceramic Bodies."

OHIO STATE UNIVERSITY†

Professional Degree of Ceramic Engineer

THOMAS MOORE ARNOLD (B. Cer. E., 1925), Cincinnati, Ohio. *Thesis:* "Use of the Hydraulic Press for Raw Material Control."

KENNETH EDWARD BUCK (B. Cer. E., 1926), Philadelphia, Pa. *Thesis:* "Protection of Coke Residue Bonds in Crucibles against Oxidation in Service."

* See also *Bull. Amer. Ceram. Soc.,* **17** [6] 275 (1938).

† Unless indicated otherwise, earlier degrees were obtained at Ohio State University.

EDWARD BURKHALTER (B. Cer. E., 1925), Spokane, Wash.

Thesis: "Study in Ceramic Body Stains and Their Suggested Uses."

FRANK BURTON CARTER (B. Cer. E., 1927), Tiffin, Ohio.

Thesis: "Cause and Correction of Blue and Green Specks in Cast Sanitary Ware."

PAUL FRANCIS COLLINS (B. Cer. E., 1927; M.Sc., 1928; Ph.D., 1930), Columbus, Ohio.

Thesis: "Decomposition of Calcium Sulfate at Elevated Temperatures in the Presence of Silica, Carbon, and Definitely Reducing Atmospheres."

HARRY DAVID FOSTER (B.E., 1920; B. Cer. E., 1931), Massillon, Ohio.

Thesis: "Manufacture of Light-Weight Clay Products by the Chemical Bloating Process."

HOBART MCKINLEY KRANER (B. Cer. E. 1921; M.Sc., 1923), Bethlehem, Pa.

Thesis: "Some Considerations in the Production of Fused Mullite for Refractories."

PYUNGTOO WILLIAM LEE (B.A., Ohio Wesleyan Univ., 1919; M.Sc., Ohio State Univ., 1922), Chicago, Ill.

Thesis: "Ceramic Products in the Dental Profession."

ROBERT WESLEY MCDONALD (B. Cer. E., 1926), Wheeling, W. Va.

Thesis: "Controlling Dunting and Shivering of Wall Tile by Employing Flints of Various Grindings."

LESTER MICHAEL MERRITT (B. Cer. E., 1918), Columbus, Ohio.

Thesis: "Manufacture of Mineral Wool from Blast-Furnace Slag."

LOUIS EDWARD NORDHOLT (B. Cer. E., 1927), Nashville, Tenn.

Thesis: "Effect of Composition on Properties of Some Sheet-Steel Enamel Ground Coats."

JAMES GORDON PHILLIPS (M.Sc., 1924), Ottawa, Ont.

Thesis: "Mineral Phases Developed in Magnesitic Dolomite Refractories during Heat Treatment."

VICTOR JEROME ROEHM (B. Ch. E., 1920), Sebring, Ohio.

Thesis: "Properties of Semivitreous Bodies Having High Flint Content."

HAROLD ELLIS SIMPSON (B. Cer. E., 1925; M.Sc., 1926; Ph.D., 1929), Pittsburgh, Pa.

Thesis: "Effect of Chemical Composition on Durability of Bottle Glass."

UNIVERSITY OF TOLEDO

Honorary Degree of Doctor of Science

HARRY B. MELLER, Managing Director, Air Hygiene Foundation, Mellon Institute, Pittsburgh, Pa.

Dr. Meller is a Senior Fellow at Mellon Institute and has been in charge of air hygiene researches at that institution for twenty years.

AWARD OF THE CHARLES FERGUS BINNS MEDAL TO C. M. HARDER

By M. E. HOLMES

The awarding of the Charles Fergus Binns Medal is a reverent tribute to the memory of a master potter and a great character, who rendered a great service to Alfred University. These are the sentiments of all his former associates and his successors who are carrying on his work. The awarding of the Medal is also a recognition of distinguished achievements in the field of ceramic art by the recipient. The Medal is awarded by a jury consisting of representatives of the American Ceramic Society, National Terra Cotta Society, United States Potters Association, and the Ceramic Guild of Alfred University. This year the award has been voted to Charles Mabry Harder.

Professor Harder was graduated from the Chicago Art Institute in 1924. Later, he spent a year in graduate work at his alma mater. In 1927, he became a member of the staff of the New York State College of Ceramics. For six years, he taught ceramic art and developed himself as a teacher and artist under the tutelage of Dr. Binns. The high regard of his students and colleagues as well as the important prizes and honors he has won at national art exhibitions testifies to the importance of the contributions he has made to his profession. Since 1931, he has been a leader in the Art Division of the American Ceramic Society, serving as its secretary and chairman. The important progress that organization has made in recent years is due largely to his efforts. For the past two years, he has had charge of the Art Department of the New York State College of Ceramics, supervising the program of developing industrial ceramic design education. In all of these capacities, he has demonstrated talent, rare ability, and inspiring leadership.

PRESENTATION OF ARTHUR FREDERICK GREAVES-WALKER FOR THE HONORARY DEGREE OF DOCTOR OF SCIENCE

By M. E. HOLMES*

Mr. President:

It is a pleasure to accept the assignment of presenting for an Honorary Degree one who is a friend and colleague of mine in the ceramic profession.

He was born in London, England. At the age of ten he came to this country. He was educated at the Haughton Preparatory School, Cleveland, Ohio, and at Ohio State University. He then started a twenty-year career in the industries, serving in the various capacities of engineer, superintendent, manager, and vice-president. With this background of industrial experience, he turned his attention to ceramic education and organized the Departments of Mining Engineering and Ceramic Engineering at the North Carolina State College, serving as the head of the latter department to date.

He is a Fellow and Past-President of the American Ceramic Society, past-president of the Canadian Ceramic Society, and past-president of the professional fraternities, Keramos and Beta Pi Kappa. He is a member of twelve other technical organizations in which he is prominent as organizer, fellow, or officer.

During the war he served the government as consultant and employee. He is the author of thirty-six technical publications, covering almost the entire field of ceramic engineering. As an associate editor of three ceramic peri-

* Dean of the New York State College of Ceramics.

odicals, he has had a prominent part in molding the character of our technical literature.

Typical of his unselfish devotion to the welfare of the ceramic profession at large are his activities during the past two years in organizing the Institute of Ceramic Engineers, in organizing the Ceramic Educational Council, and in the development of effective coöperation between the American Ceramic Society and the Society for the Promotion of Engineering Education. A busy life, crowded with projects such as these and others, has contributed to the creation of many jobs for his fellow ceramists, to the advancement of ceramic education, and to the elevation of the ceramic profession to such a high engineering status that it is winning recognition as a fundamental branch of engineering. Recognized leadership in the profession is the reward of these efforts.

Biographical Sketch

Doctor Greaves-Walker was born in London, England, March 9, 1881. His early education was received in England and in Cleveland, Ohio. He attended Ohio State University and in 1931 was given the professional degree of Ceramic Engineer.

From 1904–1906, Dr. Greaves-Walker was chief chemist and mining engineer, Olive Hill Fire Brick Co., Olive Hill, Ky; from 1906–1910, he was general superintendent, Utah Fire Clay Co., Salt Lake City; 1910–1911, chief engineer, C. W. Raymond Co., Dayton, Ohio; 1911–1913, superintendent, Southern Clay Mfg. Co., Coaldale, Ala.; 1913–1917, assistant general manager, Sun Brick Co., Toronto, Ont.; 1917–1923, production manager and director of research, American Refractories Co., Pittsburgh, Pa.; 1923–1924, vice-president, Stevens, Inc., Atlanta, Ga.; 1924 to date, professor and head, Department of Ceramic Engineering, University of North Carolina.

Dr. Greaves-Walker became a member of the American Ceramic Society in 1905. He served as vice-president in 1918; chairman, Refractories Division, 1921; chairman, Pittsburgh Section, 1923; president of the Society, 1924; member of the Board of Trustees, 1925–1927; chairman, Structural Clay Products Division, 1927, and also in 1935.

During the present year, he is serving as president of the Institute of Ceramic Engineers. Dr. Greaves-Walker is a member of Tau Beta Pi, Phi Kappa Phi, and Blue Key. He is past-president of the Canadian Ceramic Society; past-president of Keramos; and member of the following technical societies: A.S.T.M., Committee C-15; American Refractories Institute; vice-chairman, Minerals Technical Div., S.P.E.E.; Fellow, Utah Academy of Sciences; Fellow, American Association for the Advancement of Science; A.A.U.P.; National Brick Manufacturers Research Foundation; Clay Products Institute of America; and North Carolina Society of Engineers. He is chairman of the National Scholarship Commission of Sigma Pi social fraternity; and is a member of the Mystic Shrine.

During the war, 1917–1918, Dr. Greaves-Walker was chief of the Industrial Furnace Division, U. S. Fuel Administration, and consulting engineer on refractories, U. S. War Industrial Board. From 1925 to 1927, he served as consulting ceramic engineer for the U. S. Bureau of Mines.

Among his professional and practical achievements, Dr. Greaves-Walker made the following surveys: (1) survey and report on fire clays of northeast Kentucky; (2) survey and report on clays of Utah; (3) research on and design of hollow tile and brick dies; (4) development of first unfired magnesite and chrome refractories; (5) construction of American Refractories Co. plant, Baltimore, Md.; (6) development of the first diaspore refractory for general use; and (7) development of the first pyrophyllite refractories.

A. F. Greaves-Walker

Publications

Books

Clay Plant Construction and Operation. Industrial Publications, Inc., Chicago, 1919.

Drying Ceramic Products. Students Supply Store, 1932.

Enamels and Enameling. Students Supply Store, 1933.

Bodies, Glazes, and Colors. Students Supply Store, 1933.

Refractories, Their Manufacture, Qualities, and Uses (in preparation).

Editorships

Associate Editor, *Journal of the American Ceramic Society*, 1922–1927.

Associate Editor, *Ceramic Industry*, Chicago, Ill., 1923–1924.

Southern Editor, *Ceramic Age*, Newark, N. J., 1927 to date.

Partial List of Contributions to Ceramic Literature

"Fire Brick Problems of Metallurgy," *Iron Trade Rev.*, **29** (1906).

"High Alumina Flint Clays," *Trans. Amer. Ceram. Soc.*, **8,** 297 (1906).

"Construction and Operation of a Deville High Temperature Furnace," *ibid.*, **8,** 301 (1906).

"Flint Fire Clay Deposits of Northeastern Kentucky," *ibid.*, **9,** 461 (1907).

"Manufacture of Crucibles, Scorifiers, and Muffles," *ibid.*, **12,** 54 (1910).

"Manufacture of Silica Brick by the Anaconda Method," *ibid.*, **13,** 152, (1911).

"Commercial Clays of Utah," *ibid.*, **13,** 277 (1911).

"Efflorescence on Brickwork," *Ind. Eng. Chem.*, **9** (1911); *Brick Clay Rec.*, **38** (1911); *Brick Builder*, **1** (1911); *Céramique*, **14** (1911); *Brit. Clayworker*, **19** (1911).

"Design and Construction of a Producer Gas House for Clay Plants," *Trans. Amer. Ceram. Soc.*, **18,** 862 (1916).

"Electric Furnace Refractories," *Chem. Met. Eng.*, **23** (1920).

"Development of a New Refractory," *Jour. Soc. Chem. Ind.*, **41** (1922).

"Manufacture of Refractories in America," *Trans. Ceram. Soc.* [Eng.], **22** (1923).

"Suitability of the Tunnel Kiln for Firing Refractories," *Jour. Amer. Ceram. Soc.*, **6** [8] 891 (1923).

"Fire Clay and Silica Brick as Gas House Refractories," *Gas Age-Rec.*, **53** (1924).

"Ceramic Resources of North Carolina," *Manufacturers Rec.*, **89** (1926); *Ceramist*, **7** (1926).

"Development of the Nonmetallic Industries of the South," *Manufacturers Rec.*, **89** (1926).

"Elimination of Lamination in Clay Bars," *Jour. Amer. Ceram. Soc.*, **10** [4] 309 (1927).

"Ceramic Resources of the South," *Ceram. Age*, **9** (1927).

"Interdependence of Ceramic and Chemical Engineering Industries," *Chem. Met. Eng.*, **31** (1928).

"Consumption of Diaspore," *Blast Fur. Steel Plant*, **16** (1928).

"Design of Hollow Tile Dies," *Jour. Amer. Ceram. Soc.*, **11** [4] 254 (1928).

"Kyanite in N. C.," *Eng. Mining Jour.*, **24** (1930).

"Brick and Tile Clays and Shales of N. C., *N. C. Dept. of Conservation and Development Econ. Paper*, No. 63 (1930).

"Tests on Common and Face Brick of N. C.," *N. C. State College Eng. Expt. Sta. Bull.*, No. 1 (1928).

"Improving Working Qualities and Increasing Dry Strength of N. C. Shales by Addition of Common Acids to Pug Water," *N. C. State College Eng. Expt. Sta. Mimeograph*, No. 3 (1932).

"Occurrence, Properties, and Uses of Clays and Shales of N. C.," *N. C. State College Eng. Expt. Sta. Bull.*, No. 6 (1933).

"Production of Refractories from Pyrophyllite," *ibid.*, No. 12 (1936).

"Expansion of Pyrophyllite," *Bull. Amer. Ceram. Soc.*, **15** [9] 303 (1936).

"Production of an Insulating Brick Using N. C. Shales," *N. C. State College Eng. Expt. Sta. Bull.*, No. 11 (1936.)

"Location and Distribution of Ceramic Mineral Deposits of N. C.," *ibid.*, No. 14 (1937).

"Development of an Unfired and Fired Refractory from Olivine," *ibid.*, No. 15 (1937).

ADDITIONAL NOTES ON LIFE OF J. W. MELLOR

After the June issue of *The Bulletin* was on the press, additional detailed information on the life and accomplishments of the late J. W. Mellor, whose death occurred on May 24, 1938, was received in the Secretary's office.

* Dr. Mellor, who was born at Huddersfield, was taken to New Zealand as a boy. To obtain fees for higher education, he became a finisher in a shoe factory at Dunedin and went on to the University. In 1899, he married Miss Emma Cranwell Bakes and returned to England, obtaining his D.Sc. at Manchester University.

As a writer he was tireless, and at Manchester he often worked through the night with a wet towel round his head to keep him awake.

His standard work on inorganic chemistry, consisting of sixteen bulky volumes, is without parallel in the English language so far as individual authorship is concerned, and he completed it only last year. Chemists all over the world regard his efforts with profound admiration.

Each volume contains at least one million words, and nothing is more noteworthy than the many hundreds of thousands of references he quoted. To ensure their accuracy, he sought aid in many countries.

He wrote the whole of the 16,000,000 words himself and prepared all the diagrams and references. Throughout the war, he applied himself to it and for eighteen years afterwards.

Very often he limited himself to meals that lasted for no more then five minutes; he always wrote when traveling, and in his study he frequently went on writing until almost dawn.

He treated merely as notes the two volumes he had originally written, and the expanded work was produced in 1937. It was dedicated "To the privates in the great army of workers in chemistry. Their names have not been forgotten. Their work remains."

The Gmelin Handbuch on inorganic chemistry is a coöperative work, as also is that edited by Newton Friend; Dr. Mellor's achievement is the phenomenal effort of one man.

He wrote other books, and in other respects his activities were numerous. As Secretary to the Ceramic Society he played a notable part in the bicentenary celebration of Josiah Wedgwood in 1930.

The Royal Society elected him a Fellow in 1927, and, in the New Year Honours last January (1938), he was given a C.B.E. (Commander of the British Empire).

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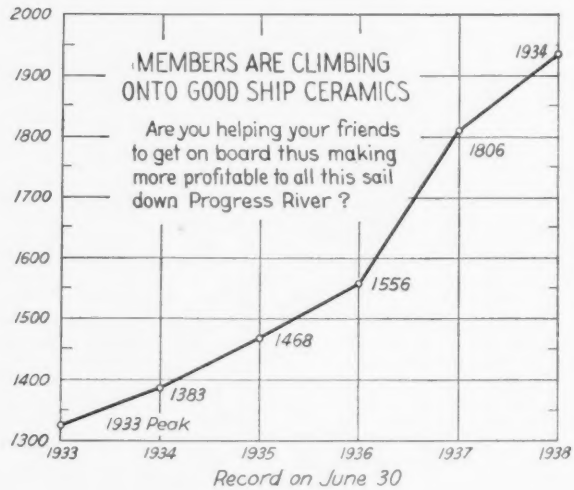
* *The London Daily Telegraph*, May 28, 1938.



MORE CERAMIC SAILORS JOIN CREW OF "GOOD SHIP CERAMICS"—SAILING PROGRESS RIVER

- Note that rise in Membership Curve!
- It is bent slightly under the weight of the worst economic recession ever experienced in the U.S.A. but still it is rising toward the 1929 peak.
- Except where there are devastating wars, the economic welfare of the industrial world, other than the U.S.A., is in good shape and is improving. Why not in the U.S.A.?
- Ceramic schools, associations, and exhibits in many nations are increasing in number, size, and activities. Industrial concerns are liberally supporting these schools, associations, and exhibits because they realize that their companies can prosper only by these organized means of research, education, and promotion. Should not U. S. ceramic manufacturers realize the benefit of financial investment in these organized means of technical advancement?
- Why are there only 210 ceramic corporations supporting this Society by payment of the minimum fee of $25.00? Is it because this privilege has not been personally presented?
- The Board has approved payment of dues on an allocated time basis; *i.e.*, persons and corporations may join in mid-calendar year and pay only the portion of the year's dues represented by the months remaining. Those who join in July need pay only one-half of the annual dues, *i.e.*, $6.25 personal and $12.50 corporation, and may purchase the publications for the first six months at 20% discount.

PAID MEMBERSHIP RECORD

Date of Record	Members Paid		Deferred	Subscriptions	Monthly Sales	Total Circulation
	Personal	Corporation				
December 20, 1936	1452	196				
December 22, 1937	1713	220	12	523	220	2688
January 22, 1938	1712	220	12	530	220	2694
February 18, 1938	1728	217	15	540	220	2720
March 18, 1938	1770	216	10	513	220	2729
April 18, 1938	1635	205	60	527	220	2647
May 19, 1938	1643	208	52	548	220	2671
A 3-year comparison June 26, 1936	1332	181	43	495	200	2251
June 22, 1937	1572	211	23	502	220	2528
June 21, 1938	1675	210	49	563	220	2717

RUGGED INDIVIDUALS GAINED EQUIPMENT BY PURSUING FORMAL STUDY COURSES BUT ACHIEVED SUCCESS ONLY BY CONTINUANCE OF STUDIES

TABLE I*

PERCENTAGE OF PERSONS LISTED IN "WHO'S WHO IN AMERICA" REPORTING DIFFERENT TYPES OF EDUCATIONAL BACKGROUND

Last education status attained (year)	1899	1901	1903	1910	1916	1922	1928	1934
College graduation	58.2	61.4	57.4	57.9	59.2	63.7	74.3	74.7
College attendance without graduation	15.5	12.3	15.0	13.2	13.7	13.7	11.6	11.8
Total college attendance	73.7	73.7	72.4	71.1	72.9	77.4	85.9	86.5
Secondary education†	15.7	16.0	17.6	18.9	18.1	14.1	7.4	6.3
Common or public school education	10.6	10.3	10.0	10.0	9.0	8.5	6.7	7.2
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Total cases in series	6024	7838	11,119	15,518	20,115	22,075	26,758	29,389

* From *The Scientific Monthly*, **46** [6] 551 (1938).

† Includes secondary, high school, and normal school education. In earlier periods, all normal school students were classed as persons having secondary education. In the 1928–1929 and 1934–1935 editions, normal school students from accredited schools were classified with college and university students.

NEW MEMBERS, May 20 to June 20

Corporation

LYNCH CORP., E. G. Bridges (voter), Anderson, Ind.

A. J. LYNCH & Co., W. W. Cadwallader (voter), 2424 Enterprise St., Los Angeles, Calif.

Personal

ALLEN, A. R., Gibbons (Dudley) Ltd., Dibdale Works, Dudley, Worcester, England.

ANDERSON, PETER, Shearwater Pottery, Ocean Springs, Miss.; president.

*DAVEY, EARL R., Canadian Ohio Brass Co., Niagara Falls, Ont., Canada; ceramic engineer.

DIXON, FRED W., JR., Gunite Foundries Corp., Rockford, Ill.; engineer.

KNAPP, ERNEST W., 1642 Cleveland Ave., N. W., Canton, Ohio; field representative, The Bonnot Co.

O'MEARA, ROBERT G., 1708 8th St., Tuscaloosa, Ala.; associate metallurgist, U. S. Bureau of Mines.

SAVELL, FRED H., 1901 E. Slauson Ave., Los Angeles, Calif.; president, Western Talc Co.

SCHWALBE, F. G., Toledo Engineering Co., Inc., 958 Wall St., Toledo, Ohio; secretary.

SMITH, G. FREDERICK, P. O. 87, Urbana, Ill.; associate professor, Univ. of Illinois.

* Indicates former member of the Society rejoining for 1938.

Student

ANDERSON, ROBERT E., Ohio State University.
ARRANCE, FRANK C., New York State College of Ceramics.
BUTLER, THOMAS J., JR., Ohio State University.
DAUGHERTY, SAM P., Ohio State University.
FOSS, HALLVARD, North Staffordshire Technical College, England.
HITE, EARL E., Ohio State University.
SANTOMIERI, S. LEWIS, New York State College of Ceramics.
TEAGUE, DESMOND F., New York State College of Ceramics.
TEETER, JOHN N., University of Illinois.
WASHBURN, LUCIUS, New York State College of Ceramics.

MEMBERSHIP WORKERS' RECORD

Corporation

B. M. Burchfiel	1	J. T. Ogden	1

Personal

B. M. Burchfiel	1	J. T. Ogden	2
T. N. McVay	1	Office	5

Student

R. M. Campbell	3	V. V. Kelsey	1
J. L. Carruthers	1	A. S. Watts	1
M. E. Holmes	1	Office	3
		Grand Total	**21**

ROSTER CHANGES DURING JUNE*

Personal

BERKELHAMER, LOUIS H., Saranac Laboratory, P. O. Box 551, Saranac Lake, N. Y. (Columbus, Ohio)
BLANKENSTEIN, EDWARD E., 417-B South Taylor Ave., Oak Park, Ill. (Cicero, Ill.)
BRAY, KENNETH J., Rossmoyne, Ohio. (Norwood, Ohio)
CANNAN, WILLIAM, JR., 100 Gibbs St., Rochester, N. Y. (New Castle, Pa.)
CATON, MILTON W., 22490 Nevada, East Detroit, Mich. (Mt. Clemens, Mich.)
CHASE, BYRON L., 2700 N. Main St., Santa Ana, Calif. (Los Angeles, Calif.)
COOKE, RAYMOND D., 1865 North 70th St., Wauwatosa, Wis. (Milwaukee, Wis.)
ECHAVARRIA, NORMAN, c/o Hijos de Alejandro Echavarria & Cia., Medellin, Colombia, South America. (Manchester, England)
HARVEY, E. M., Route 3, Box 471, Greensboro, N. C. (Pomona, N. C.)
HAZARD, ROWLAND, 120 Wall St., Trailer & Robinson, New York, N. Y. (La Luz, New Mexico)
HEDQUIST, ALFRED J., Buffalo Pottery, Buffalo, N. Y. (Norris, Tenn.)
HUNTER, R. G., Muncie, Ind. (Butler, Pa.)
MASSEY, CRAWFORD, Box 122, Downey, Calif. (Hollydale, Calif.)
MONCRIEFF, J. W., 5212 Camden St., Oakland, Calif. (San Francisco, Calif.)
NESMITH, LEONARD C., 122 W. Palmer, Glendale, Calif. (La Crescenta, Calif.)
PALMER, RUFUS N., 5516 Wilkins Ave., Pittsburgh, Pa. (Oakmont, Pa.)
POWELL, WILLIAM R., Big Savage Refractory Corp., Frostburg, Md. (Mexico, Mo.)
SCHATZ, STUART, 306 S. Main St., White Hall, Ill. (St. Louis, Mo.)
WESTFELDT, MARTHA G., Little Green House, Arden, N. C. (New Orleans, La.)
WILCOX, HERMAN G., 787 Loretta St., Pittsburgh, Pa. (Homestead, Pa.)
YOUNG, VINCENT M., 41 Walbert Dr., Coldwater, N. Y. (Rochester, N. Y.)

Student

BARBOUR, DAVID J., 23 William St., Yonkers, N. Y. (Rutgers Univ.)
BRAMLETT, WILLIAM P., JR., 428 Waverly Rd., Glenside, Pa. (Pennsylvania State College)
CARSON, B. R., JR., Wakefield, Va. (Virginia Polytechnic Institute)
COWLIN, KENNETH S., 1507 Lincoln Way E, Massillon, Ohio. (Pennsylvania State College)
HAVELL, RICHARD F., 13 Ashland Ave., River Forest, Ill. (Univ. of Illinois)
HENDERSON, JOHN H., 2018 E. Main St., Springfield, Ohio. (Ohio State Univ.)
JACKSON, ARTHUR W., 409 W. Court St., Paragould, Ark. (Ohio State Univ.)
KNOBLER, ALFRED E., 1595 Bathgate Ave., New York, N. Y. (Virginia Polytechnic Institute)
LEWIS, MARVIN O., 2610 Bird Dr., Wesleyville, Pa. (Pennsylvania State College)
LYNN, BERT M., Brockway Clay Co., Brockway, Jefferson Co., Pa. (New York State College of Ceramics)
PROE, JOSEPH A., JR., 526 William St., Elmira, N. Y. (New York State College of Ceramics)
RIGGS, SOLOMON G., JR., 1110 Holston Ave., Bristol, Tenn. (Univ. of North Carolina)
SMITH, ALFRED W., Box 250, Fonda, N. Y. (New York State College of Ceramics)
TOMKINS, DAVID E., 438 College St., East Liverpool, Ohio. (Pennsylvania State College)
WHITEHEAD, MERLIN H., 2154 State St., Granite City, Ill. (Univ. of Illinois)

* Address in parentheses is the former address.

Forward-going aggressive ceramists succeed only by continually studying, not narrowly, but broadly, the current problems in all ceramic fields.

WILLIAM ERNEST STANLEY TURNER, FELLOW OF THE ROYAL SOCIETY

William Ernest Stanley Turner, O.B.E., D.Sc., M.Sc., F.Inst.P., F.S.G.T., has recently been honored with election as Fellow of the Royal Society in England. Dr. Turner is internationally known for his work in glass technology. He has been a member of the American Ceramic Society since 1917; he was granted a Complimentary Membership in 1927; and in 1934, the American Ceramic Society honored itself by electing Dr. Turner to Honorary Membership.

At the Twenty-First Annual General Meeting of the Society of Glass Technology, April 13, 1938, at Sheffield, England, Dr. Turner received the heartiest congratulations on his election as Fellow of the Royal Society.

* "It was most appropriate that this honour, one of the most coveted distinctions in the scientific world, should be accorded to Professor Turner soon after the conclusion of the Twenty-First Anniversary celebrations of the founding of the Department of Glass Technology in Sheffield, and similar celebrations of the founding of the Society of Glass Technology, and of the magnificent response by the glass industry to the Elmfield Appeal Fund. It is a high light in the most important year of the Society's existence.

"Of many honours which Professor Turner has received during his career testifying to his work as investigator, administrator, and practical believer and instigator of international coöperation, none has given his many friends greater pleasure and satisfaction than his recognition by the Royal Society. Professor Turner has been the recipient of many congratulatory letters by which friends and colleagues in all parts of the world have shown their pleasure at this honour.

"The honour is accorded Professor Turner for his work in glass technology and is shared alike by the Society of Glass Technology and the glass industry."

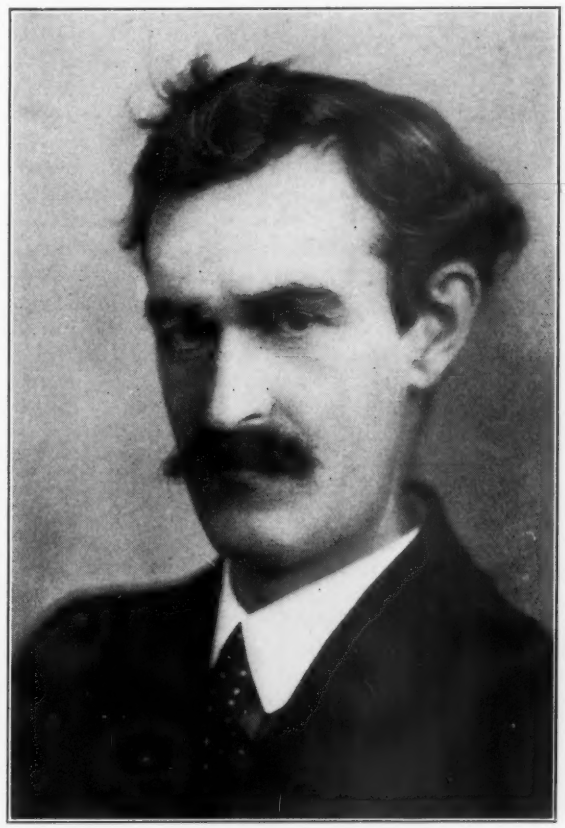
EDITOR'S NOTE: "Twenty-One Years: A Professor Looks Out on the Glass Industry" was Dr. Turner's Presidential Address to the Society of Glass Technology in November, 1937. This address has been printed on special paper and issued in book form. The price in the United States is $2.75. Copies may be ordered from F. C. Flint, Hazel-Atlas Glass Co., Zanesville, Ohio.

Biographical Sketch

Dr. Turner was born September 22, 1881. He was educated at King Edward VI School, Birmingham; Mason University College, and Birmingham University. In 1902, he received the degree of Bachelor of Science (London), with Chemistry Honours. In 1903 and 1904, he was Research Scholar at the University of Birmingham, and he was Ehrhardt Research Prizeman in 1904. The degree of Master of Science was conferred upon Dr. Turner in 1904 by Birmingham University, and in 1911 he received the degree of Doctor of Science from the University of London. He was appointed lecturer in Physical Chemistry at University College, Sheffield, in 1904, and Senior Lecturer, 1907, introducing this branch of chemistry into the curriculum of metallurgy. From 1907 to 1914, Dr. Turner was engaged in extensive researches in problems of physical chemistry, becoming one of the recognized authorities on the subject of molecular association.

Dr. Turner Tells His Own Story†

There are few men today in middle age or older whose lives and careers were not greatly influenced and diverted, in many cases permanently, by the duties or the opportunities of the Great War. It was so in my case; for until 1914 I knew no more about glass than the average chemist of my time and knew less still of the world of glassmaking and its fascinating problems.



W. E. S. Turner

In 1904, I was appointed lecturer in Physical Chemistry in the University (or University College, as it was until 1905) of Sheffield. The early researches on which I had spent my teething time seemed no longer attractive, but I became interested in the subject of Molecular Association. Then followed a period from about 1906 until 1915 when investigations on the subject engrossed my own time and that of a number of research workers who came to work with me; and between those dates there were published some 30 papers in well-known chemical journals, mainly on this subject of molecular association. In 1915, a monograph by myself on this same subject was published by Longmans, in a well-known series of monographs of physical chemistry. This subject, by the way, though so

* From *Jour. Soc. Glass Tech.*, **22** [90] 109 (1938).

† Written May, 1938.

far removed, apparently, from glass techology, has considerable bearing on studies of the nature of glass.

But academic though such work would seem to mark my earlier career, I was nevertheless interested in the human side of chemistry: in its value to human beings and in its reactions on industry; and in the city of Sheffield, with its dominating interest in metallurgy, I devised special courses, probably the first of their kind, in which the latest knowledge of physical chemistry was applied to problems of metallurgy. I was greatly interested in the work of Professor R. Kennedy Duncan at Kansas and later at Pittsburgh, a movement which has grown into the great Mellon Institute, and in 1910 I conducted a correspondence with him; whilst I myself published a small popular book dealing with the work of the chemist in industry and life. In 1914, as President of the Sheffield Society of Applied Metallurgy, I had seen something of manufacturing problems and appreciated some of the technical difficulties which arose in an industrial community at the outbreak of the War owing to the sudden cessation of many supplies previously imported. To help solve some of these difficulties I persuaded the University in September, 1914, to set up a technical Advisory Committee and I myself acted as Secretary. It was then that the story of glass began to be revealed to me; for amongst the problems brought to the Committee were those of glass manufacture and we discovered that the University was situated in a most important glassmaking area; and that neither the industry on the one hand nor the University on the other had ever attempted to seek one another out. And now it seemed to me that something must be done about it; for we had learned to our cost that munitions can not be produced satisfactorily without scientific control, and scientific control means lots of chemical and scientific glassware, all of which had for many years been imported. Accordingly, I proceeded to make a survey of the surrounding glass industry and to consider not only its needs but that of the whole of the country also; and the result was that the University Council accepted a report and a recommendation from me to found a Department of Glass Technology to provide facilities for higher instruction and research in all branches of glass technology. The decision was taken in 1915. Reference is made to the new Department as providing "higher instruction." So it does, but in fact, our earliest work, and work we have continued to support, was to go out to the centres of the industry and there set up elementary courses to stimulate the desire for more advanced knowledge.

In a comparatively few years, the Department grew to one of the largest in the University so far as staff is concerned and its output of published researches and reports far greater than any other Department in the period. Since 1914, there have been published nearly 400 researches and reports covering many aspects of glass technology and some of them opening up entirely new fields; whilst, in addition, since 1925, the monthly "Glass Review" has been published by the Department.

The Department is financed in large measure by annual contributions from practically all the important glass manufacturing firms of Great Britain and its Dominions; and these firms have the privilege of receiving advice and help from the Department, which involves the senior members of the staff in a course of systematic visitation to the works throughout the country. The intimacy of this contact between science and practice through a central scientific institution is scarcely to be matched in any other industry. Testimony to the value of that work has frequently been forthcoming, and lately has been illustrated by the speed with which a sum of nearly £40,000 has been subscribed by the industry to erect a new set of buildings for the Department on a beautiful site. By the end of the present summer we hope to occupy them and begin a new phase in our history.

The story of the Society of Glass Technology is a parallel story of a great venture with great results both for the science of glass technology and in binding men of like interests all over the world. In 1916, I saw the need to form such a Society to bring together members of the industry to discuss technical problems in their widest aspects and in the autumn of that year got people together to discuss the formation of such a Society. The War had stirred up many manufacturers to a confession of their own technical deficiencies and their desire for information, and thus the time was propitious. The Society was founded in November, 1916, with Mr. Frank Wood, also an enthusiast and very charming person, as President and myself as Secretary—and, it may be added, Editor. Success was immediate. We introduced at once the system of intervisitation of works, a thing which was simply not done before the Department and the Society got to work. The first *Journal* of the Society appeared in May, 1917, and proved quite a pleasant surprise to Council and members. Despite the need to stimulate the British glass industry, we had scientific ideals to serve and there was no narrow exclusiveness, only a few months had elapsed when we began to welcome members from abroad, particularly from the States, until now, and for many years, the membership has been world-wide. In keeping with these same scientific and visionary ideals, we sought to strengthen our connections abroad by visitations. That to the States in 1920 set the ball rolling. Some thirty-four of our members took part in it, and it has never been forgotten by them. Similar visits followed later to France, Belgium, Germany, Italy, and Denmark, and return visits have been received from most of these countries. It was under the influence of this system of visitation that the International Congress on Glass and Ceramics was set on foot in 1933 at Milan and Venice, and the enthusiasm and drive from the glass side made possible the International Congress on Glass in England in 1936.

So far as organized effort is concerned, we in England are fortunately placed in that traveling distances are short. From the outset I had pressed that our meetings should, in rotation, be held at different centres of the industry, and as some nine meetings of the Society are held annually, and technical committee meetings are usually held before the general sessions, matters are kept in a state of flux. Moreover, the younger men are given their chance in the Local Section meetings which we have established in the past eight years in London, the Midlands, and Yorkshire. The total number of members of the Society at present is approximately 750. As everybody knows who has experience, it is not merely papers and

discussions, in general session or in Committee, which attract and help members; the informal over-the-table talk is a great asset, as is well known in the American Ceramic Society Glass Division. In the Society of Glass Technology we certainly provide plenty of opportunity for it.

LIST OF ORIGINAL INVESTIGATIONS PUBLISHED BY W. E. S. TURNER

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(2) "Molecular Weights of Amides in Various Solvents (Preliminary Note)," with *A. N. Meldrum, ibid.*, **91,** 165 (1907).

(3) "Molecular Complexity of Amides in Various Solvents," with *A. N. Meldrum, ibid.*, **93,** *T*876 (1908).

(4) "Possible Intramolecular Change in Inactive Phenylalkyloxyacetic Acids (Preliminary Note)," *ibid.*, **95,** 201 (1909).

(5) "Affinity Constants of Hydroxy- and Alkyloxy-Acids," with *A. Findlay* and G. E. Owen, *ibid.*, p. *T*938.

(6) "Study of the Landsberger-Sakurai Boiling-Point Method of Determining Molecular Weights," *ibid.*, **97,** *T*1184 (1910).

(7) "Molecular Complexity, in Liquid State, of Amines, Nitriles, and Amides (Preliminary Note)," with E. W. Merry, *ibid.*, p. 128.

(8) (*a*) "Molecular Complexity, in Liquid State, of Tervalent Nitrogen Compounds," with E. W. Merry, *ibid.*, p. *T*2069.

(*b*) "Molecular Complexity of Amides in Various Solvents: II," with *A. N. Meldrum, ibid.*, p. *T*1605.

(*c*) "III, Amides in Aqueous Solution," *ibid.*, p. *T*1805.

(9) "Molecular Association and Its Relationship to Electrolytic Dissociation; Molecular Complexity of Halogen-Containing Compounds," *ibid.*, **99,** *T*880 (1911).

(10) "Molecular Association in Water," with *C. J. Peddle, ibid.*, **99,** *T*685 (1911).

(11) "Molecular Condition of Some Organic Ammonium Salts in Bromoform," *ibid.*, **101,** *T*1923 (1912).

(12) "Solubilities of Alkali Haloids in Methyl, Ethyl, Propyl, and Isoamyl Alcohols," with C. C. Bissett, *ibid.*, **103,** *T*1904 (1913).

(13) "A Simple and Efficient Method of Dehydrating Substances by Electrical Heating in a Vacuum," with C. C. Bissett, *ibid.*, p. 233.

(14) "Improved Apparatus for Determination of Molecular Weight by the Landsberger-Sakurai Method," with C. T. Pollard, *ibid.*, p. 349.

(15) "Solubilities of Salts of Ammonium bases in Water and in Chloroform: I, Solubility as a Constitutive Property," with *C. J. Peddle, ibid.*, p. *T*1202.

(16) "Criticism of Holmes' Method of Determining Molecular Complexity of Liquids," *ibid.*, **105,** 29 (1914).

(17) "Consistent Molecular Formulae," *ibid.*, p. 110.

(18) "Connexion between Dielectric Constant and Solvent Power of a Liquid," with C. C. Bissett, *ibid.*, p. *T*947.

(19) "Molecular Weights of Some Salts of Alkali Metals and an Account of Compounds of These Salts with Alcohols," with C. C. Bissett, *ibid.*, p. *T*1777.

(20) "Nature of Molecular Association; Its Relation to Chemical Combination," with S. English, *ibid.*, p. *T*1786.

(21) "Influence of Solvents on Molecular Weights: I, Salts," with C. T. Pollard (and J. D. Cauwood, W. R. Garrett, and P. Haller), *ibid.*, p. *T*1751.

(22) "Viscosities of Mixtures of Formamide with Alcohols," with *S. English, ibid.*, p. *T*1656.

(23) "Action of Steam on Sodium Chlorides (Preliminary Note)," with *S. English, ibid.*, p. 162.

(24) "Viscosities of some Binary Liquid Mixtures Containing Formamide," with *E. W. Merry, ibid.*, p. *T*748.

(25) "Dielectric Constants of Some Organic Solvents at Their Melting or Boiling Points," with *J. D. Cauwood, ibid.*, **107,** 276 (1915).

(26) "Freezing-Point Diagrams of Formamide with Water and Aliphatic Acids and their Bearing on Interpretation of Viscosity Measurements," with *S. English, ibid.*, p. 774.

(27) "Complexité Moleculaire dans l'État Liquide," *Jour. Chim. Phys.*, **10,** 467 (1912).

(28) "Note on Interpretation of Molecular Weight Results from Measurements on Solutions (with special reference to paper by Beckmann and Maxim), *Jour. Amer. Chem. Soc.*, **37,** 2063 (1915).

II. Original Investigations in Glass Technology

(1) Raw Materials for Glassmaking (Batch Mixing)

(29) "Relative Advantages and Disadvantages of Limestone, Burnt Lime, and Slaked Lime as Constituents of Common Glass Batches Containing Soda-Ash and Salt-Cake: I," with *F. W. Hodkin, Jour. Soc. Glass Tech.*, **5,** 188 (1921).

(30) "Composition of Lime Suitable for Various Purposes in Glassmaking," with *Violet Dimbleby, ibid.*, **6,** 221 (1922).

(31) "Some Observations on Mixing of Glass Batches in Factories," with *A. W. Dickenson,* Violet Dimbleby, and L. E. Norton, *ibid.*, p. 234.

(32) "Influence of Moisture on Mixing of Glass Batches" (Rept. to Glass Research Assn.), *Bull. Glass Research Assn*, No. 5, p. 33 (1922).

(33) "Influence of Moisture on Mixing of 'English Crystal' Potash-Lead Oxide Batches," with *E. M. Firth,* F. W. Hodkin, and M. Parkin, *ibid.*, No. 10, p. 31 (April, 1934).

(34) "Influence of Moisture on Mixing of Batches for Soda-Lime-Silica Glasses," with *M. Parkin, Jour. Soc. Glass Tech.*, **10,** 114 (1926).

(35) "Influence of Moisture on Mixing of Batches for Potash-Lead Oxide-Silica Glasses," with *M. Parkin, ibid.*, p. 213.

EDITOR'S NOTE: The list of original investigations which have been published by Dr. Turner is evidence of the many years of active research work and painstaking recording of his scientific discoveries.

In the case of papers published with co-authors, the paper is indexed under the name of the author first mentioned, indicated by italics; in other cases under that of W. E. S. Turner.

(36) (*a*) "Specifications for Raw Materials in the Glass Industry," *ibid.*, **17,** 18 (1933).

(*b*) "Soda Ash," *ibid.*, p. 22.

(*c*) "Requirements of Manganese in the Glass Industry," (by V. Dimbleby), *ibid.*, p. 33.

(2) Refractory Materials

(37) "Note on Solubility of Clay in Glass," with *J. H. Davidson, Jour. Soc. Glass. Tech.*, **2,** 280 (1918).

(38) "Composition, Drying and Firing Shrinkage, Porosity and Density of British Fireclays Suitable for Glass-Furnace Refractory Materials," with *E. M. Firth,* and F. W. Hodkin, *ibid.*, **4,** 162 (1920).

(39) "Shrinkage, Porosity, and Other Properties of a China Clay after Being Fired at Various Temperatures," with *E. M. Firth* and F. W. Hodkin, *ibid.*, p. 264.

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(42) "Some Observations on the Corrosion of Fireclay Materials by Alkali Salts," with *D. Turner, ibid.*, **7,** 207 (1923).

(43) "Corrosion of Fireclay by Alkali-Lead Oxide Glasses," with *E. M. Firth,* F. W. Hodkin, and D. Turner, *ibid.*, p. 218.

(44) "Effect of Saltcake in Soda-Lime Batches in Corroding Fireclay Refractory Materials," with *E. M. Firth* and F. W. Hodkin, *ibid.*, p. 228.

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(46) (*a*) "Commercial Sillimanite as a Refractory Material in Glassmaking: I, Choice of Bonding Material and Grain Size," with *A. Cousen, ibid.*, **9,** 334 (1925).

(*b*) "II, Porosity, Density, and Mechanical Strength of Sillimanite-Ball-Clay Mixtures," with *A. Cousen, ibid.*, p. 347.

(*c*) "III, Resistance to Corrosion by Glass," with *A. Cousen* and S. English, *ibid.*, p. 357.

(47) "Some Uses of Commercial Sillimanite in Glass Works," with *A. Cousen, ibid.*, **10,** 416 (1926).

(48) "Attack of Arsenic Compounds on Fireclay Refractory Materials," *Jour. Amer. Ceram. Soc.*, **9** [7] 412–17 (1926).

(49) "Naturlicher Sillimanit als Feuerfester Stoff in der Glasindustrie," *Glastech. Ber.*, **5,** 4 (1927–1928).

(50) "Survey of Manufacture and Use of Glasshouse Pots in Great Britain," *Jour. Soc. Glass Tech.*, **11,** 415 (1927).

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(52) "Glasshouse Pots for Melting English Crystal Glass: an Agreed Specification," *ibid.*, **15,** 95–98 (1931).

(53) "Note on Some Special Forms of Corrosion of Fireclay Pots Used for Melting Potash-Lead Oxide-Silica Glass," with *E. Preston, ibid.*, **16,** 240 (1932).

(3) Glass Furnace Problems, Including Lehrs

(54) "Note on Unusual Type of Recuperative Tank Furnace," with *F. W. Hodkin, ibid.*, **8,** 252 (1924).

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(56) "Commercial Importance of Furnace Design," *ibid.*, **19,** 184 (1935).

(4) Alloys for Molds

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(61) "Decomposition Pressure and Rate of Decomposition of Calcium Carbonate," with *G. H. Whiting, Jour. Soc. Glass Tech.*, **14,** 409 (1930); German version, *Glastech. Ber.*, **9,** 226 (1931).

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(63) "Some Further Experiments on Rate of Decomposition of Calcium Carbonate," with *W. Maskill, ibid.*, **16,** 80 (1932).

(64) "Reaction between Calcium Carbonate and Silica," with *W. Maskill* and G. H. Whiting, *ibid.*, p. 94.

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(69) "Effect of Small Additions of Water on Reactions in Mixture $6SiO_2 + Na_2CO_3 + CaCO_3$," with *J. E. Stanworth, ibid.*, **21,** 285 (1937).

(70) "Effect of Small Additions of Alumina on Reactions in the Mixture $6SiO_2 + Na_2CO_3 + CaCO_3$," with *J. E. Stanworth, ibid.*, p. 299.

(71) "Effect of Small Additions of Sodium Sulphate on Reactions in Mixture $6SiO_2 + Na_2CO_3 + CaCO_3$," with *J. E. Stanworth, ibid.*, p. 359.

(6) Volatilisation of Glasses

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peratures of the Sodium Silicate-Silica Glasses," with *E. Preston, ibid.*, p. 331.

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(7) Practical Studies of Melting, Refining, and Working Properties of Glasses

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(83) "Some Common Problems in Melting and Working Glass: I, Substitution of Saltcake by Soda; II, Relative Sizes of Gas and Air Ports," *ibid.*, p. 210.

(84) "Properties of Lime-Soda Glasses," with *J. H. Davidson, ibid.*, **3,** 222 (1919).

(85) "Some Experiments on Glass for Lamp-Working Purposes," with *J. D. Cauwood*, J. H. Davidson, and F. W. Hodkin, *ibid.*, p. 266.

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(87) "Comparative Effects of Soda and Potash in Lead Glass for Tableware," with *F. W. Hodkin, ibid.*, **4,** 120 (1920).

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(99) "Influence of Water on Rate of Melting and Working of Lime-Soda Glass," *ibid.*, No. 6, p. 25 (1923).

(100) "Use of Boric Oxide in Glassmaking," *Jour. Amer. Ceram. Soc.*, **7** [5] 313–17 (1924).

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(103) "Influence of Grain Size of Batch Materials on Rate of Melting," with *E. M. Firth*, F. W. Hodkin, and M. Parkin, *ibid.*, No. 10, p. 20 (1924).

(104) "Effect of Moisture on Melting, Working, and Other Properties of Potash-Lead Oxide Batches of the 'English Crystal' Type," with *E. M. Firth*, F. W. Hodkin, and M. Parkin, *ibid.*, No. 10, p. 41 (1924).

(105) "Function of Arsenious Oxide in Soda-Lime Glass: II," with *E. M. Firth*, F. W. Hodkin, M. Parkin, and F. Winks, *ibid.*, No. 11, p. 5 (July, 1924).

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(107) "Some Glasshouse Tests to Determine Differences in General Characteristics and in the Working Properties of Molten Glass," *ibid.*, No. 12, p. 36 (Feb., 1925).

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(114) "Function of Arsenic in Glass: V, Potash-Lead Oxide Glasses," with *S. English*, E. M. Firth, and F. W. Hodkin, *ibid.*, No. 13, p. 89 (1925).

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(120) "Composition of Glass Suitable for Use with Automatic Glassforming Machines," *ibid.*, p. 80.

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(132) "Homogeneity of Glass Melted in Pots on Commercial Scale," with *Mrs. G. A. Green*, *ibid.*, p. 407.

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(138) "Effect of Cullet on Melting and Working Properties of Potash-Lead Oxide-Silica Glasses," with *S. English*, Mrs. G. A. Green, and F. W. Hodkin, *ibid.*, p. 37.

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(140) "Influence of the Grain Size of Batch Materials on the Rate of Melting," with *Mrs. G. A. Green*, F. W. Hodkin, and M. Parkin, *ibid.*, p. 57.

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(142) "Note on Homogeneity of Small-Scale Glass Meltings in Platinum," with *V. Dimbleby* and H. W. Howes, *ibid.*, p. 243.

(143) "Effect of Boric Oxide on Rate of Melting and on Some Physical Properties of Colourless Bottle Glasses," with *V. Dimbleby*, M. Parkin, and F. Winks, *ibid.*, p. 259.

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(152) "Notes on Possibility of Preparing Glasses Containing P_2O_5, Al_2O_3, B_2O_3, and SiO_2," with *J. E. Stanworth*, *ibid.*, **21,** 368 (1937).

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(171) "Effect of Magnesia on Resistance of Glass to Corroding Agents and Comparison of Durability of Lime and Magnesia Glasses," with *Violet Dimbleby* and C. M. M. Muirhead, *ibid.*, p. 101.

(172) "Action of Water and Steam under Pressure on Some Soda-Lime Silicate Glasses," with *F. W. Hodkin, ibid.*, p. 291.

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GEORGE N. JEPPSON

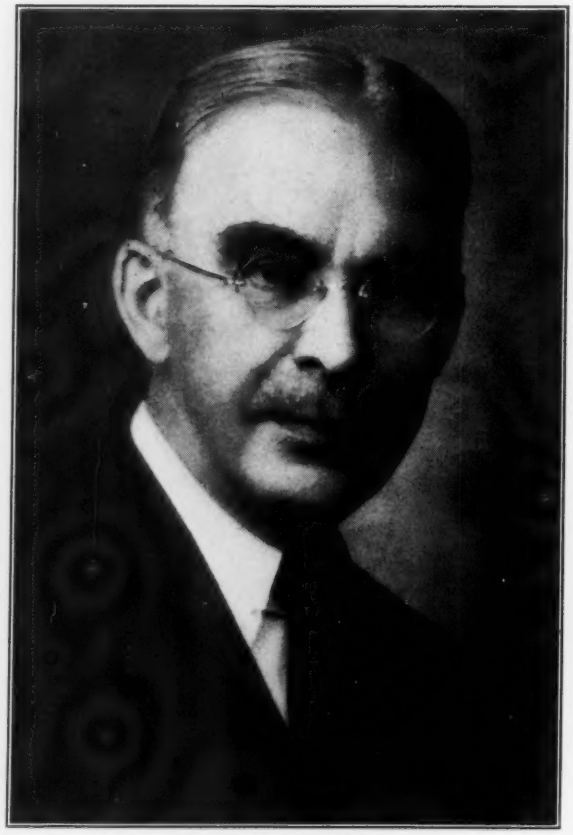
George N. Jeppson, Vice-President and Treasurer of the Norton Company, celebrated his sixty-fifth birthday anniversary April 14, 1938. Upon this occasion Mr. Jeppson was honored with a banquet by the Board of Directors of the Guaranty Bank and Trust Company, of which he is president. A handsome, engrossed testimonial was presented to him. A miniature newspaper entitled *The Jeppsonian Grinder* was prepared for the occasion. This newspaper contained some interesting drawings and a page devoted to milestones in Mr. Jeppson's career, from the time he was a student in Highland Military Academy in 1891 to his sixty-fifth birthday.

George Nathaniel Jeppson was born April 14, 1873, at Worcester, Mass. He is the son of John Jeppson, one of the founders of Norton Company. After the death of his father in 1920, Mr. Jeppson assumed full charge of Norton production. His mother was Thilda A. Ahlstrom, and both of his parents were of Swedish ancestry.

Mr. Jeppson was educated at the public schools in Worcester, later attending Highland Military Academy and Worcester Polytechnic Institute, supplemented by a course at the Royal School of Mines at Stockholm, Sweden. Before going abroad to finish his technical career in Sweden, he was with the Norton Company for five years, and upon his return to the United States in 1898, he again entered the service of that corporation for the purpose of learning the business from the ground up. During the World War, he served on the Worcester Local Draft Board.

He became a member of the American Ceramic Society in 1919 and was elected Fellow of the Society in 1936.

Mr. Jeppson is held in high esteem among the Swedish people of Worcester. He was decorated with the Order of Vasa by King Gustaf V of Sweden in 1926 and also with rank of commander of the Royal Order of Vasa on Christmas eve, 1937. Knighthood in the Royal Order of the North Star was conferred on him in 1933 in acknowledgment of his services to the business interests and students of Sweden.



George N. Jeppson

NOTES AND NEWS

OHIO CERAMIC INDUSTRIES ASSOCIATION

Heavy Clay Products Division

Members of this Division held a meeting on May 24, 1938, at the plant of the Timken Roller Bearing Company, Canton, Ohio. Following an inspection trip, luncheon was served at the Shady Hollow Country Club. During the afternoon, a technical session and business meeting was held. The following officers were elected for 1938–1939:

Chairman: GEORGE W. DENISON, The Ohio Clay Co., Cleveland, Ohio.

Vice-Chairman: E. F. THEOBALD, Metropolitan Paving Brick Co., Canton, Ohio.

Papers were presented by (1) M. C. SHAW, Orton Ceramic Foundation, Columbus, Ohio, "Use of 'Red Series' of Pyrometric Cones"; (2) H. Z. SCHOFIELD, Ohio State Univ. Engineering Experiment Station, "Thermal Expansion Curve"; and (3) C. A. AUSTIN, Battelle Memorial Institute, Columbus, Ohio, "Workability of Clays."

Refractories Division

Members of the Refractories Division met on June 7 at the Marting Hotel, Ironton, Ohio. The officers elected for 1938–1939 were as follows:

Chairman: L. F. SIMS, Manager, Aetna Fire Brick Co., Oak Hill, Ohio.

Vice-Chairman: H. R. ORWICK, Massillon Refractories Co., Massillon, Ohio.

The following papers and discussions were presented:

(1) "Base Exchange in Fire Clays and Its Effect upon the Physical Properties and Workability," by R. P. GRAHAM, Battelle Memorial Institute.

(2) "Problem of Selective Mining," by D. D. DAVIS, Davis Fire Brick Company.

(3) Discussion of "Necessity of Educating the Mine Superintendent on Quality of Various Grades of Clay at the Mining Face," by C. E. BALES, Ironton Fire Brick Co., Ironton, Ohio.

(4) Discussion on "Problem of Shrinkage of Insulating Refractories," by S. M. PHELPS, Mellon Institute, Pittsburgh, Pa.

GEORGE H. DUNCOMBE, JR., WITH BATTELLE MEMORIAL INSTITUTE

George H. Duncombe, Jr., for four years engineer with the National Aluminate Corporation, Chicago, Ill., has joined the staff of Battelle Memorial Institute, Columbus, Ohio, and has been assigned to research in ceramics, according to an announcement by Clyde E. Williams, director.

Mr. Duncombe was graduated from Ohio State University's Ceramic Engineering Department in 1915. He became plant foreman for the Howard Fire Brick Company in St. Louis; he served at the same time as research engineer and was plant superintendent from 1920 to 1924. From 1925 to 1931, he was associated with the Clay Products Association, first as a field fellow at Mellon Institute, Pittsburgh, and then on various research and development assignments with headquarters at Urbana, Ill.

For two years following, he engaged in consulting work for ceramic companies and for the Illinois Geological Survey.

In 1935, Mr. Duncombe received the degree of Ceramic Engineer from Ohio State University. He was recently elected a Fellow of the American Ceramic Socity.

PORCELAIN ENAMEL INSTITUTE MEETINGS OF TECHNICAL COMMITTEES

The Advisory Committee on the Fellowship which the Porcelain Enamel Institute maintains at the National Bureau of Standards, met in Washington, May 19, 1938. This committee consists of *Chairman*, J. E. Rosenberg, O. Hommel Co., Inc., Pittsburgh, Pa.; W. H. Pfeiffer, Frigidaire Corp., Dayton, Ohio; R. R. Danielson, Metal & Thermit Corp., Carteret, N. J.; and B. T. Sweely, Chicago Vitreous Enamel Product Co., Cicero, Ill. (*ex-officio*). P. H. Bates, Chief of the Ceramic Division, Bureau of Standards, W. N. Harrison, Chief of the Enameled Metals Section, Bureau of Standards, and Paul L. Smith, Research Fellow for the Institute, met with this Committee. The Committee reviewed the work which had been conducted on impact tests by Dr. Smith, during the past year, and recommended that the Institute assign him to the development of a standard test for resistance to chipping.

On the next day, May 20, 1938, the Committee on Standardization of Tests of the Porcelain Enamel Institute met at the Bureau of Standards. The following were present: *Chairman*, W. N. Harrison, Bureau of Standards, Washington, D. C.; C. H. Commons, Titanium Alloy Mfg. Company, Niagara Falls, N. Y.; C. K. Keller, Ingram-Richardson Mfg. Company, Frankfort, Ind.; G. H. McIntyre, Ferro Enamel Corporation, Cleveland, Ohio; W. H. Pfeiffer, Frigidaire Corporation, Dayton, Ohio; J. T. Roberts, The Crane Company, Chicago, Ill.; J. E. Rosenberg, O. Hommel Company, Inc., Pittsburgh, Pa.; G. H. Spencer-Strong, Porcelain Enamel & Mfg. Co., Baltimore, Md.; Fred Sutphen, American Rolling Mill Company, Middletown, Ohio; B. T. Sweely, Chicago Vitreous Enamel Product Company, Cicero, Ill.; J. D. Tetrick, Baltimore Enamel & Novelty Company, Baltimore, Md.; Leo Shartsis, Bureau of Standards, Washington, D. C.; R. R. Danielson, Metal & Thermit Corp., Carteret, N. J. (*ex-officio*); R. H. Turk, Porcelain Enamel & Mfg. Co., Baltimore, Md. (*ex-officio*); R. M. King, Ohio State University, Columbus, Ohio (*Technical Director*); P. L. Smith, Porcelain Enamel Institute, Washington, D. C. (*Research Fellow*); and C. S. Pearce, Porclain Enamel Institute, Chicago, Ill. (*Secretary*).

This Committee received the report of the Advisory Committee on the Fellowship, at the Bureau of Standards. As noted above, this report recommended a new project, standard test for chipping resistance, to be undertaken during the ensuing year.

The Committee discussed the following standard tests which were suggested for future development: weather resistance, tearing resistance, thermal resistance, chipping, spontaneous chipping, alkali resistance, sagging of metal, scratch test, crazing of cast iron, adherence, and color tolerance. The importance of each one of these tests was recognized, but it was decided that the number should be reduced to a group upon which intensive work could be started during the present year. After a lengthy discussion it was agreed to proceed with the following: (1) thermal shock test, (2) alkali resistance test, (3) sagging of metal test, (4) standard test for resistance to chipping.

The Tentative Test for Acid Resistance of Porcelain Enamels, which was published by the Porcelain Enamel Institute in April, 1937, was reviewed and certain minor changes made. It was then adopted as the permanent standard Test for Acid Resistance of Porcelain Enamels, and will be issued by the Porcelain Enamel Institute as such.

This Committee also discussed at length the necessity of additional research work to develop tests, which are applicable to porcelain enameled products, and recommended to the Porcelain Enamel Institute that the work in coöperation with the Bureau of Standards be carried forward in an aggressive manner.

PUBLICATION OF THE AMERICAN ENAMELER DISCONTINUED

The Porcelain Enamel & Mfg. Company has announced the discontinuance of the publication, *The American Enameler*. W. R. Greer, vice-president of the Company, makes the following statement regarding this change of policy: "From time to time, as the occasion demands, we shall publish briefs on pertinent information for the enameler. These will come to you so they may be incorporated into a handy reference file. It is hoped that in taking this step, we shall better serve you in bringing to you more information that is of direct importance and interest."

NATIONAL EXHIBITION OF CONTEMPORARY AMERICAN CERAMICS

Contemporary American ceramics from the Sixth National Exhibition, assembled and circulated by the Syracuse Museum of Fine Arts, were exhibited at the Du Pont Exhibit on the Boardwalk at Atlantic City through June 26. This is the first time since its inauguration that this annual showing of pottery and sculpture from the foremost ceramists of the country has been on public display in any place outside of art museums and art galleries. The group comprises the collection of over 200 pieces chosen for the circuit of exhibition, including all the prize-winning and most of the honorably mentioned works in the entries received from 27 states.

In accordance with the aims of the Syracuse Museum, as stated by R. Guy Cowan, leading ceramist and a member of the jury of selection and award, the collection was shown to Atlantic City visitors "to educate the American public to take an intelligent interest in ceramic art and to realize that ceramics is a major art."

Following is the list of entries which were awarded prizes in the competition: for ceramic sculpture, first prize, Mathilde Parmelee, Greenwich, Conn.; second prize was divided between Ruth Randall, Syracuse University, and F. Jean Thalinger; first prize for pottery went to Roger D. Corsaw, University of Oklahoma; second prize to Richard V. Smith, Skaneateles, N. Y.; and third prize to Aloys Sacksteder.

Among other ceramics on display were several not entered in the competition, including pieces by Waylande Gregory, Viktor Schreckengost, Russell Barnett Aiken, Paul Bogatay, Henry Varnum Poor, Carl Walters, Whitney Atchley, and A. Drexel Jacobson.

THIRD INTERNATIONAL CONGRESS OF GLASS TECHNOLOGY

The Third International Congress of Glass Technology will be held in Berlin and Munich, Germany, July 6–15, 1939. Otto Seeling has been selected as President of the Congress.

SILICOSIS SOUND MOTION FILM

The director of the U. S. Department of Labor, Division of Labor Standards, V. A. Zimmer, has announced that this Division has available for nontheatrical distribution a one-reel sound motion picture entitled "Stop Silicosis." It can be obtained by interested organizations either in 16-mm. or 35-mm. safety prints.

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NECROLOGY

H. H. STEPHENSON

Word has been received of the death of H. H. Stephenson, Auburn, New South Wales, Australia. Mr. Stephenson, the son of a missionary, was born in India fifty-seven years ago.

From 1903 to 1914, he was employed at Doulton's in England. During the years of the World War, 1914–1918, he made explosives. He came to the United States about 1923, and after several years in Zanesville, he went to Canada. Since 1930, he has resided in New South Wales.

Mr. Stephenson was well known as an abstracter of science journals, a position which he held for thirty-one years.

He had been a member of the American Ceramic Society since 1923.

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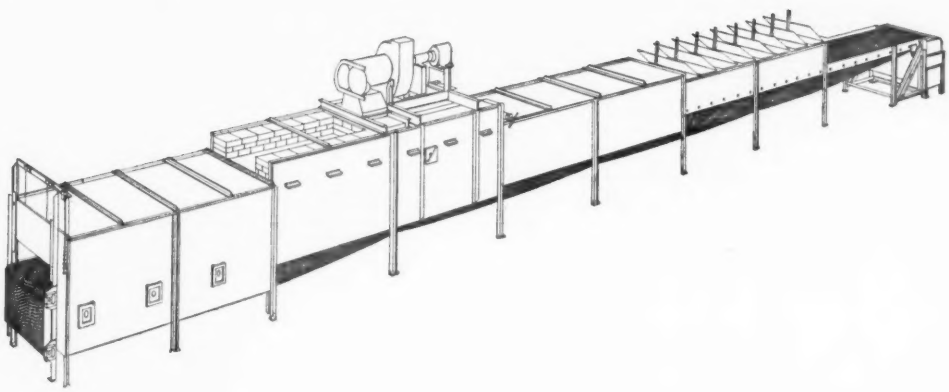

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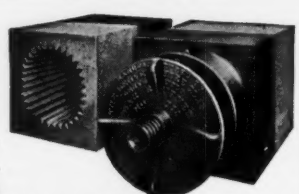

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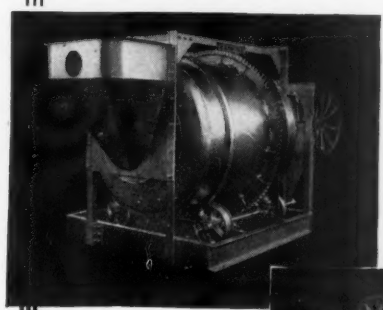

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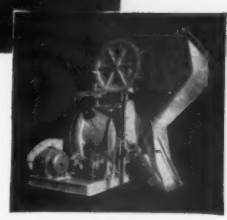

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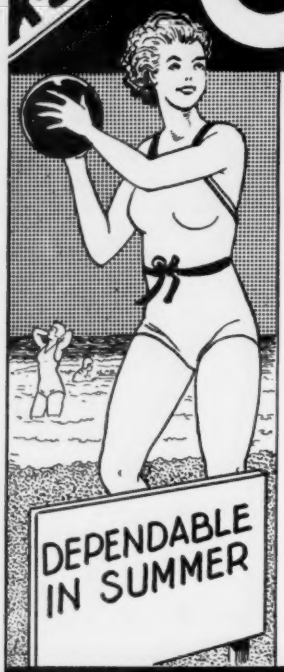

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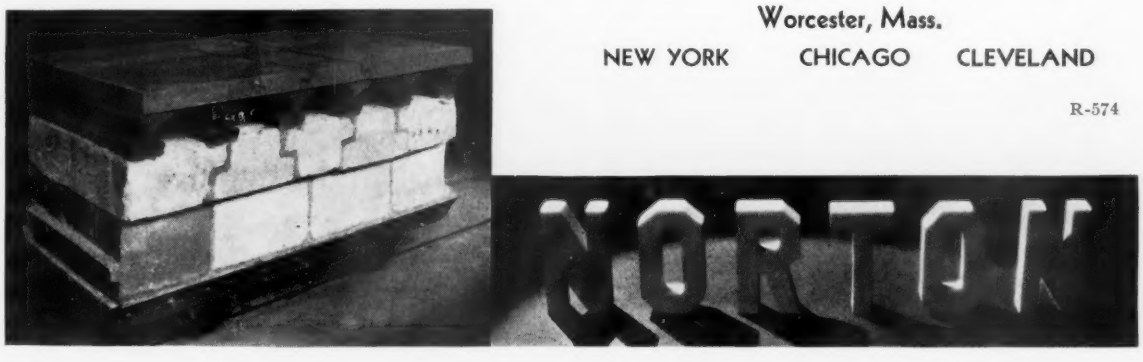

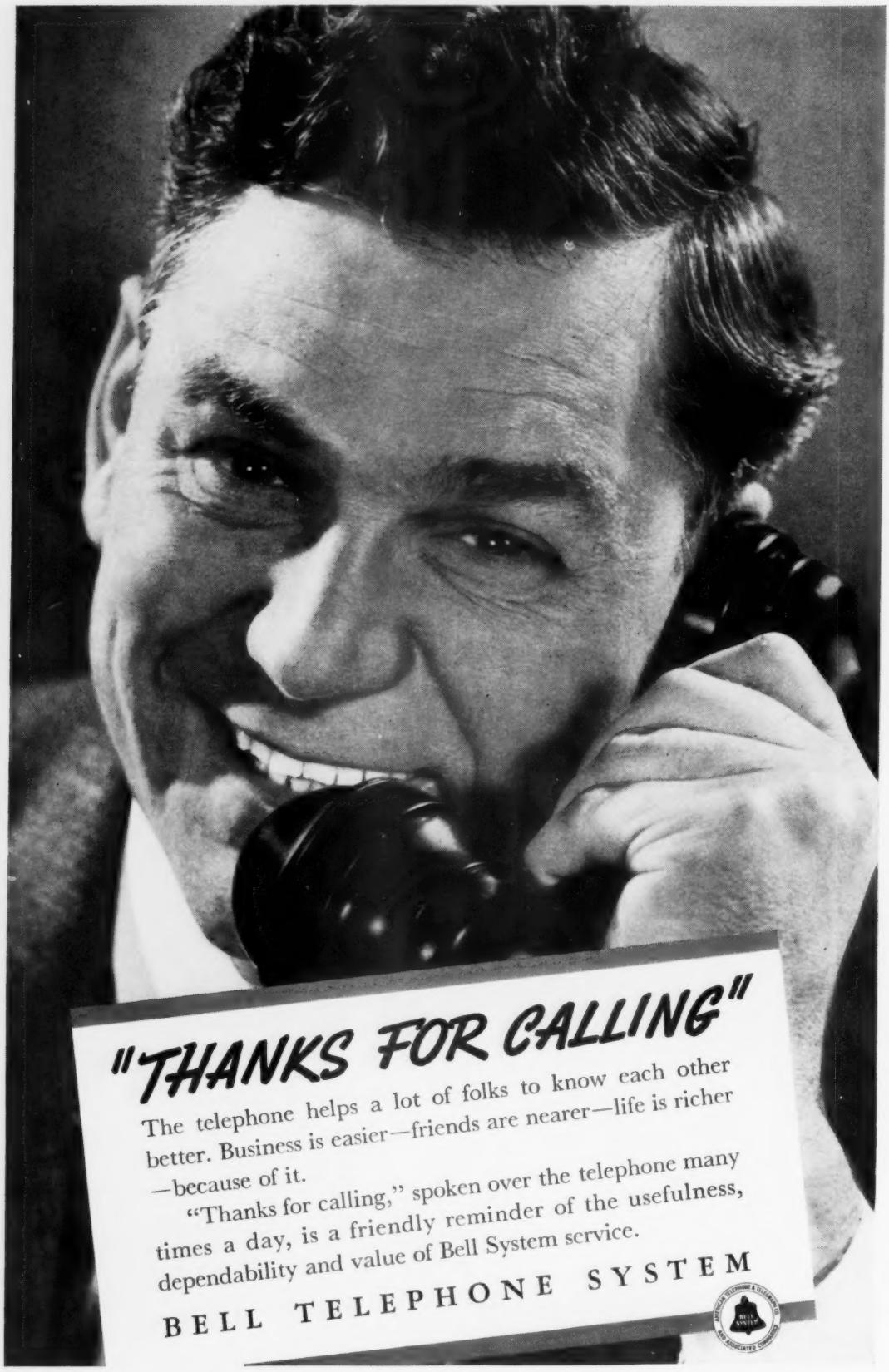
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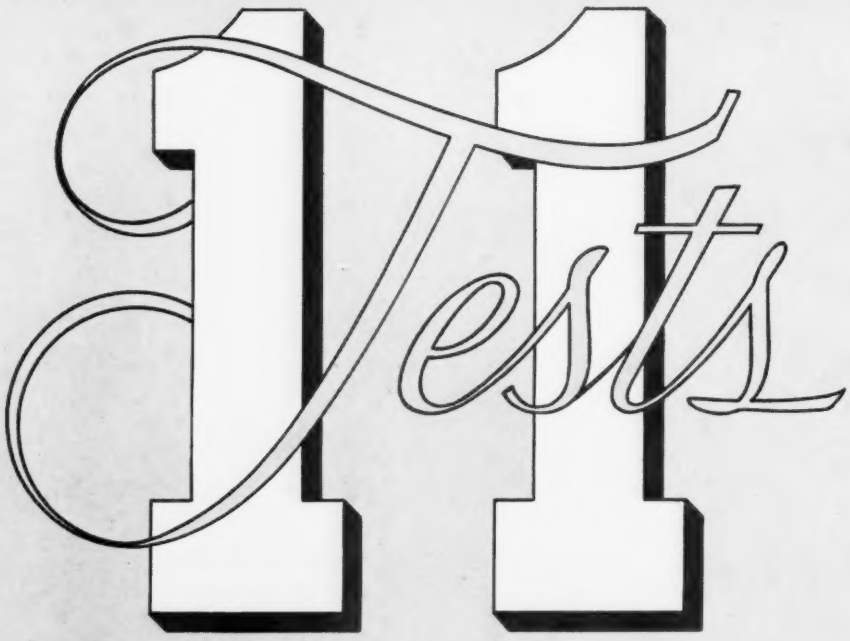

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